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## RUBBER IN MALAYA, 1911.

The following notes on the rubber industry in Malaya are taken from the report of the Director of Agriculture, for 1911 .—

**Acreages.**

The land opened for rubber in the Federated Malay States during 1911 reached the enormous total of 107,200 acres; this is more than double that opened during 1910, which again was higher than any previous year. The largest increase is recorded in Perak, where 40,791 acres were opened as against 15,612 in 1910; the 1911 openings, in fact, increase the total Perak acreage by about 50 per cent. In Negri Sembilan the proportionate increase was enormous, rather more than 66 per cent; 30,488 acres being opened in 1911 as against 44,868 previously. It is possible that part of the total increase shown is due to a more thorough census having been taken this year, but this will hardly account for more than a fraction of the total.

**The Output.**

The rubber output for the Federated Malay States in 1911 is returned as 21,809,617 lb., an increase of about 75 per cent. over that for 1910—that year's figures were 12,563,220 lbs., against 6,083,493 lbs. in 1909. Had it not been for the drought, to be referred to later, there is every reason to suppose that the 1910 output would have been doubled.

The acreage producing at the end of the year in the Federated Malay States totalled 105,635, which gives an approximate yield per acre of 200 lbs. It must be remembered that a good deal of this is rubber brought into bearing during the year, and that some of it was tapped for only part of the year. Of the total 105,635 acres, 85,579 probably represents rubber planted before December 31, 1906, and the remaining 20,000 about one-half the acreage planted during 1907.

The total production for Malaya in 1911 increased by about 70 per cent. over that in 1910, amounting to 11,118 tons. My estimate of an increase of 10,000,000 lbs. for 1911 was thus quite approximately correct, the actual figure being 10,535,180 lbs. There is at present every prospect of the estimate for succeeding years, given in my last report, being exceeded.

The output for 1911 would doubtless have been considerably higher but for the abnormally dry weather experienced during the early part of the year. Conditions were so bad in some districts that several estates had to cart their drinking water for estate staff and coolies several miles. Even on estates where this necessity was not felt, the yield of rubber fell off, in many cases from 25 to 30 per cent.

Although the total rainfall in 1911 was actually greater than that of 1910, it was much more unevenly distributed. There was a large deficiency in February and a much longer continued one from May to the end of July, followed by heavy rains at the end of the year.

The following shows the monthly export of rubber from Selangor as recorded by the Commissioner of Trade and Customs. Although this is not quite the same as the output for the same periods, it will serve to show the correspondence between the rainfall and the production of rubber. The export naturally lags some weeks behind the production.

| | Export | Increase over previous month. | Increase |
|---|---|---|---|
| | lb. | lb. | Per cent. |
| January ... ... | 706,274 | 50,190 | 7.7 |
| February ... ... | 833,246 | 126,972 | 17.9 |
| March ... ... | 1,128,884 | 295,638 | 35.5 |
| April ... ... | 673,195 | 455,689† | 40.3† |
| May ... ... | 585,655 | 87,540† | 13.0† |
| June ... ... | 661,443 | 75,788 | 12.9 |
| July ... ... | 779,591 | 118,148 | 17.8 |
| August ... ... | 781,200 | 1,609 | 0.2 |
| September ... ... | 879,671 | 98,471 | 12.6 |
| October ... ... | 1,259,373 | 379,702 | 43.1 |
| November ... ... | 1,081,730 | 177,643† | 14.1† |
| December ... ... | 1,127,755 | 46,025 | 4.2 |

†Decrease.

These figures are very different from the continuous increase that should have been shown had conditions been normal. The enormous drops after the end of March were clearly dependent upon the deficient rainfall during February and from May to Sep-

tember, especially May to July. It was not until October that the figure for March was again reached, although under normal conditions there should have been a steady increase from the new areas being brought under tapping.

Had the figures for monthly output been available, in place of the export, it is probable that the correspondence between rainfall and production would have been even more clearly brought out. It is possible that the large March export was exceptional and not representative of the production in that month.

**The Labour Force.**

The total estate labour force for the Federated Malay States is returned at 166,015 as compared with 128,446 in 1910, an increase which hardly keeps pace with the increase in acreage. The average works out at rather less than one cooly for two acres. The returns of the Indian Immigration Department show a satisfactory increase in the number of Indian immigrants and a satisfactory decline in the proportion of those returning to India.

In Selangor, by far the greater proportion of labourers are Tamils, 37,000 out of a total of 71,000 being of this race; in Perak there is a smaller preponderance of Tamils, though they still form more than one-half of the labour force; in this State we have the largest proportion of Javanese and Malay labourers. In Negri Sembilan, the Chinese slightly outnumber the Tamils.

**Acreage.**

The total acreage planted with rubber in the Federated Malay States, at the end of 1911, is 352,974 acres, against 245,774 in 1910, an increase of, approximately, 40 per cent. In the unfederated States of Johore, Kedah, Kelantan and Trengganu, the total acreage returned is 109,274 acres, of which 74,974 acres, or nearly three-fourths, is in Johore.

**Cultivation.**

Discussion still continues as to the best planting distance, though wider planting is finding more and more supporters. I do not think that any unprejudiced observer going round some of the older clearings and seeing the manner in which closely planted trees are crowding their foliage together, are losing their lower branches from light starvation and are failing to renew their bark properly, can fail to come to the conclusion that one hundred trees to the acre is the maximum number that should be allowed. Even if this is reduced to eighty by accidental losses and by disease and pests, there would still be an ample number to occupy ground and air. Whether planting $20 \times 20$ feet or $30 \times 15$ should be resorted to is a matter of convenience in working, and not of fundamental importance.

Catch-crops are still little in favour and practically only used where it is absolutely necessary to secure a certain amount of re-

venue before the rubber itself comes into bearing. In the Federated Malay States only 13,382 acres out of a total of 352,974 under rubber are interplanted, or less than four per cent; in 1910, the corresponding figure was 13,977 acres or nearly six per cent. Coffee (mostly coffee robusta) accounts for 5,411 acres of the total and is the principal catch-crop grown. Over 2,000 acres are under rubber and coconuts—a particularly unsound mixture of two particularly sound cultivations. Sugar, gambier, tapioca and pepper probably account for the greater part of the remaining interplanting.

The Department of Agriculture is still experimenting with a large variety of cover crops, some twenty-two species of leguminous plants having been tried at Kuala Lumpur during the year. The ideal to be arrived at is a rapidly growing plant which quickly shades the soil sufficiently to keep down the weeds, it should also have a short life so that within the year it can be cut down, dug in and re-sown, thus providing for cultivation, improvement of the soil and eradication of weeds. If such a cover could give a product of commercial value at the same time, this would be an additional advantage, but the soil treatment should be the first consideration. Some of the plants tried appear to give promise of being good covers, but the first year's results with leguminous crops are usually uncertain.

**Treatment of Soil.**

The cultivation usually given to rubber trees is hardly worth the name, consisting, in the majority of cases, of a scraping the surface of the soil to remove the weeds. I am of opinion that more than this is required to induce and maintain healthy soil conditions. At least once a year, probably twice would be better, the soil should receive a thorough cultivation to a depth of at least four inches. This would break up the hard surface layer and allow the free access of air to the soil in which the roots are feeding, and would thus tend to create a healthier condition for root growth and for the continued production of available food salts in the soil. The roots would not tend to grow in the surface layer but would be forced deeper into the soil. During dry weather the trees would not suffer to anything like the same extent they do now, as the soil water would be prevented from rising to the surface where it evaporates. Combined with a good leguminous cover crop, such a system of cultivation, carried out from the beginning, would, I am convinced, improve the growth and health of the rubber immensely.

In many cases the conditions would be further improved by, at the same time, giving the soil a good dressing of lime. Many Malayan soils are either acid or clayey, both classes would usually derive much benefit, physically and chemically, from liming.

A number of enquiries have been received during the year as to the advisability of manuring. While in certain cases manures

may be required, as shown by backward growth or starved appearance of the rubber trees, yet I am of opinion that this is not so in most cases. So called "experiments" have been carried out and have been quoted as proving enormous gains from manuring; these usually consist in putting manure around certain trees and digging it in; then, if any improvement is noted, it is attributed to the manure, whereas it is equally likely to be due to the cultivation. True manurial experiments require to be very carefully planned, and there must always be a check plot which is treated in every detail the same as the others, except for the one point that it receives no manure. A set of experiments on the manuring of young rubber has been started in Kuala Lumpur, which it is hoped will supply reliable information as to the manurial requirements of rubber on this type of soil, which is, probably, of less than average fertility.

Pruning is another subject that has required a good deal of attention during the past year. In nearly all old rubber, particularly where the trees are closely planted, a certain number of the lower branches are gradually starved out and die; they thus become a source of weakness to the tree and serve as points of entry for fungi and insects. During the dry weather this tendency was much intensified, and on some estates number of these branches died so rapidly that the leaves had not time to fall, but remained withered on the dead shoots. No bad results followed where the pruning was quickly and carefully carried out, although at the time the appearance of the fields was somewhat alarming. As a general rule, all these weak, shaded branches should be removed before they begin to die. The pruning should be done very carefully, the branch should be cut off smooth, right down to the main stem, and no splitting permitted. The wound should be given a good coating of coal tar which should be renewed as frequently as is necessary until the wound is healed over.

**Tapping Methods.**

The tapping of rubber trees is, I think, showing improvement generally, both as regards quality and quantity of bark removal. As regards quantity of bark removed a conservative procedure is more and more coming into favour and very few estates now allow for less than four years' renewal of the bark. The systems by which this is brought about vary considerably, single V's, double V's, one quarter, half-herring bone, alternate quarters, every day and alternate day tapping, all find their advocates, and probably the exact system followed is not of primary importance. Experiments are being carried out by the Department on this point and will be referred to later; unfortunately, reliable results cannot be expected from these for at least four years, and probably it will

be safer to wait eight before finally drawing conclusions from them. Some estates are adopting systems allowing for even more than four years renewal of bark, while I still find a few that are removing one half their tapping area each year; the condition of these trees after the second round of tapping must certainly be very poor.

Are search is being carried out by Mr. Bateson, assistant mycologist, on the depletion of the food reserves of Para rubber trees by tapping and other natural demands on the vitality of the trees. The research has already brought some interesting facts to light and it is expected will have a direct bearing on the many questions connected with tapping. It is expected that the work will be sufficiently advanced for publication in 1912.

The quality of tapping, by which I mean the number of cuts to the inch and the proper depth of the cuts, is a subject on which planters as a whole are keenly interested. Twenty cuts to the inch is a very good average, although a good many more than this are claimed by some estates. The cuts should, of course, be sufficiently deep to tap all the latex and yet must avoid injuring the cambium, which lies immediately beneath. When it is considered that a good coolie will do over 1,000 cuts per day, besides the incidental work of bringing in his latex, washing cups. pails, etc., it is evident that it requires very skilled labour to avoid all mistakes.

When bad tapping is met with it is usually traceable to one of two causes. Either the labour force is new or is always changing, resulting in unskilled tappers being employed, or else there is insufficient supervision of the coolies. It is no light task, over several hundred acres, to see that each coolie is performing his work and what is more, performing it properly. If owing to pressure of work in the factory or on weeding, or in office, a manager or his assistant is only able occasionally to visit the bearing area, it is to be expected that either the full tapping is not done, trees here and there missed, or what is worse, it is done hurriedly and carelessly and the trees suffer permanent damage. A sufficient and efficient staff on an estate is true economy.

When wounds are made in tapping they should be treated, as suggested in my report for 1910, by painting them over with coal tar. This is done on some estates as a routine measure, with excellent results. The tar must, of course, be of the right consistency, sufficiently fluid to be painted on (a stalk of a rubber leaf makes a good brush) but not fluid enough to run down the bark. The tapper should be made to paint all the wounds on his own trees : he does not like it, as it draws attention to his mistakes, but, when perserved in, the system is of great advantage from this point of view alone, besides achieving its primary object, which is to assist in getting a clean growth of new bark over the wound.

**Manufacture.**

Crepe and smoked sheet still balance one another as the favourite forms in which plantation rubber is exported. Towards the end of the year there was practically no difference between the prices obtained for these two forms of rubber. I still retain my preference for smoked sheet over crepe, though, undoubtedly, much of the fine crepe produced in the Federated Malay States is excellent rubber. A great deal of extra work on estates have been caused by the demand in the market for a very light coloured crepe. This is, I think, quite an unnecessary refinement, and the exact shade of colour of fine crepe has really very little bearing in its quality. When this is realised a good many managers will be saved a large amount of time and trouble involved in grading their rubber to a dozen or more different shades of colour, the whole of which are of one perfectly uniform quality.

The Agricultural Chemist has been working nearly all the year on special research work on rubber coagulation and curing. A large number of interesting facts have been ascertained and a Bulletin will shortly be published as a preliminary report on this subject, so that it is unnecessary in this report to refer to the subject in any detail.

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## NOTES ON COCONUT CULTIVATION.

By R. W. Munro.

Although that time-honoured, and well worn expression "Consols of the East" stands a chance of soon becoming rather tiresome, the interest taken in what we understand to be the synonymous term "Coconuts" with its cultivation and its products does not appear in the near future to warrant any other name becoming more applicable.

One often hears it said how "sound" coconuts are as an investment, and one is often asked how relatively speaking the profits derived from them compare with other tropical products.

All questions of this kind are very difficult to answer, but I think it may be safely laid down that there is no cultivation that responds more gratefully to attention and special treatment, no matter on what soil the trees happen to be growing. We are not so much concerned, I think, with the cultivation as we hear of it from other Tropical Countries (although comparisons as a rule naturally afford food for quite a considerable amount of reflection), chiefly on account of the variation in climate and local conditions: it may therefore be assumed that from an economic standpoint each country must have its own basis on which to form its particular rules and propound its doctrines.

It appears to be a very general impression that making a success or otherwise of a coconut plantation depends entirely upon the soil chosen, but it is difficult to understand why more stress should be laid on this when coconut planting is under consideration than on any other form of cultivation in this country. Undoubtedly the question of soils is one that must be taken into regard very carefully, inasmuch as it is a generally accepted fact that wherever land is chosen for opening an estate the block must be capable of perfect drainage; at the same time it has been found that sometimes the best looking free soil which doubtless contains more organic matter, and which brings the trees into bearing at an abnormally early age is not necessarily capable of yielding the lasting returns that can be recorded from soils of a stiffer type. Taking all this into consideration, however, the one point that appears to stand out above all others is the question of treatment of the soil, especially when the trees are nearing the producing stage; and it is obvious how little attention is given as a rule to the benefits derived from keeping the soil in a friable state by ploughing, or harrowing. The roots of the tree are made by this means to find their way to regions of permanent moisture, the loose soil on the surface acting as a mulch, and preventing evaporation. The deeper the roots go, the better able the tree is to withstand droughts. and to bear better crops, and one cannot get away from the scientific fact that aeration of the soil renders the plant food in the soil more soluble. It is not of rare occurrence to notice instances where labour and money is being misplaced in carrying out the doctrine of clean weeding at the obvious expense of cultivation.

I know of one estate on which large sums of money are being spent on the purchase and application of artifical manure, because a serious falling off in the crop was noticeable. The soil on the blocks to which this manure is being applied, and on which trees of 12 years old are growing, has not been turned over, or harrowed since the jungle was cleared, so it is not surprising that the trees are calling for some kind of treatment; but I think the policy of artifical manuring in a case of this sort cannot be too strongly condemned, and should in any case be resorted to only when the trees have failed to respond to every other kind of treatment, or the soil has been impoverished by padi or any other equally exhausting crop.

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## PADI EXPERIMENTS IN KRIAN.

By E. Bateson.

In the early part of last year some experiments on padi cultivation were commenced by Mr. Pratt, Government Entomo'ogist, and the writer of this article, and a brief preliminary account of the work appeared in the *Agricultural Bulletin* of the Straits Settlements for

October, 1911. The area then under experiment was eighteen acres. This year a considerably larger area has been taken in hand, amounting altogether to nearly a hundred acres, and as the final results and conclusions will probably not be available until the end of three years, it is thought advisable to publish a short description of the experiments at the outset.

The object of the experiments is, in the first place, to discover what methods are best for improving the poor padi land in Krian. It has been found that some of the land included in the irrigation scheme is unsuitable for padi growing, Most of the natives who took this land held it for a short time and then ran away, and those who have remained in occupation of it have the utmost difficulty in making a living. The greater part of the land in question is adjacent to the main road between Simpang Tiga and Bagan Serai, and the eighteen acres on which experiments were begun last year are situated in this area. The three plots were selected in different parts, so as to preclude the possibility of conducting the experiments on only one kind of soil.

The first year's crop has now been obtained, and the average yield was about five times as great as the yield in former years. This result is distinctly encouraging. The treatment was commenced only three months before the land was flooded, and it is confidently expected that the future crops will show a further increase.

As described in the previous paper, three methods of treatment were adopted on these plots, namely draining, changkolling and liming. The application of lime seems to have had no effect on the first year's crop, and therefore the results obtained so far must be ascribed to the combined effects of draining and changkolling. It is not possible from the results of the experiments to say what is the relative value of these two methods, but it is of great importance that this should be known, and part of the new experiments commenced this year have been devised with that end in view. These experiments will now be described. It should be mentioned that changkolling was resorted to last year because ploughs could not be obtained in the short time at our disposal. This year all the work has been done by ploughs,

*Draining and ploughing experiments.* These are being carried out on a block of land on the Siakap road near Bagan Serai. The land is divided into a number of long, narrow strips, each strip forming a separate *bindang* or "lot" about six acres in extent. Twelve of these "lots" can be used for experiments if required.

In planning the experiments great care had to be taken to prevent local conditions from upsetting the results. Some of the *bindangs* are lower than others, and are therefore flooded to a greater depth when the irrigation water is turned on. More important even

than this is the fact that the nature of the soil varies, both on the different lots and in different parts of the same lot. It follows that without any treatment there would be wide differences in yield from different parts of the experimental area.

In order to overcome these difficulties it was necessary that a fairly large stretch of land should be experimented on, and, further, that it should be divided up into a large number of small plots, so that the same experiment could be repeated under all the different conditions both of elevation and of soil. It was therefore decided to devote six *bindangs* to these experiments. Three were drained and three left undrained, and the drained and undrained pieces alternated. The drains made were the ordinary type of open earth-drain. One was dug all round the *bindang*, and cross drains were made two chains apart.

The cross drains divided up the *bindang* into small plots each about a quarter of an acre in extent, and the undrained pieces were divided up into plots of a similar size. These plots are being used for the ploughing experiments. In both drained and undrained *bindangs* some check plots were left unploughed, and there are consequently plots of four different kinds, namely, (1) Drained and Ploughed, (2) Drained only, (3) Ploughed only, and (4) Undrained and Unploughed. The results of these experiments ought to enable us to decide with certainly whether ploughing or draining is the more efficacious way of dealing with this poor padi land.

It is a general practice in most padi-growing countries to plough just before planting, but with such a large area to be dealt with it was necessary to make a much earlier start than this, and half of the plots were ploughed as soon as possible after harvesting. The rest were ploughed just before the water was turned on the land, It is a keenly disputed point whether early or late ploughing gives better results on padi land, and this experiment will, it is hoped, do something to settle this question.

A certain number of plots were ploughed twice, once early and once late, and it will be interesting to see if there is an extra yield sufficient to compensate for the extra labour.

The positions of the plots ploughed in these different ways were carefully chosen, so as to have them as well and evenly distributed as possible.

*Manurial Experiments.* Three lots on the Siakap road have been set aside for these experiments. The manures which are being tried are (1) Perlis guano, (2) farmyard manure and (3) commerical fertilisers, namely ammonium sulphate, basic slag and potassium sulphate. Experiments on a smaller scale are being tried on clay soils at Sungei Bogak and on the boundary road near Parit Buntar, A green manure has also been tried at Simpang Tiga.

A good deal of interest is being shown by the natives in this part of the experiments. It is not difficult to understand this. The application of a little manure seems to the Malay a temptingly easy method of increasing his crops, whereas ploughing, apart from the initial outlay, means hard work. It is very probable, however, that ploughing will give much better results on most of the soils in Krian, and if this proves to be so care will be taken to demonstrate the fact to the natives by having ploughing experiments side by side with the manurial experiments in all cases.

*Experiment on seed selection.* Up to the present there appears to have been no attempt to improve the padi grown in this country by seed selection. A start has been made this year with padi Pahit, a variety which is probably very capable of improvement on account of the lightness of its grains.

Selection is carried out by the simple process of immersing the seed padi in a concentrated solution of common salt in water. The heavier grains sink to the bottom and are used as seed, the lighter grains which float being rejected. This method has been used with success in Japan and India.

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## SYNTHETIC RUBBER.

By M. Barrowcliff.

Now that the controversy aroused by Professor Perkins' announcement shews signs of abating perhaps a brief resume of the facts and opinions disclosed may not be without interest to the readers into whose hands this publication may be expected to fall.

The history of the subject dates back to 1860, when Greville Williams obtained from the products of the destructive distillation of rubber a product he termed isoprene, and observed moreover that this substance when heated with acids was partially re-changed into something resembling rubber in appearance.

The next explorer in this field was Bouchardet (1875) who obtained other products by heating caoutchouc, such as di-isoprene etc., together with isoprene and came to the conclusion that they, and rubber itself, are polymers of isoprene, that is are primarily derived by the condensing or combining together of numbers of molecules of isoprene. The same worker also drew attention to the similarity of his di-isoprene to turpentine, a remark of great significance as subsequent events shewed.

These researches paved the way for the noteworthy advance made by Sir William Tilden in 1884, who succeeded in preparing isoprene from turpentine—its first production from a substance other than rubber itself—and definitely foreshadowed the possibility of the commercial manufacture of the latter substance. He was not much

more successful at the time than his predecessors in attempts to condense the isoprene but, eight years later, on examining the bottles in which it had been stored, found in them a substance having all the properties of natural rubber and like it capable of being vulcanized.

Little further progress however was made until several years ago, when the rapid increase in the price of the natural article began to direct the attention of chemists to the problem of its artificial production. Almost simultaneously apparently the question was taken up by Professor W. H. Perkin and by Messrs. Strange and Graham's chemists, under Dr. F. E. Matthews, in England, and by Bayer & Co., the Badische Anilin und Soda Fabrik, and Messrs. Schering in Germany.

Isoprene naturally was the pivot on which the first experiments were based, to discover, if possible, a method by which it could be readily turned into rubber. The Bayer Co., after innumerable trials decided that heat was the most favourable reagent for effecting the change, and patented a process giving results fair but much inferior to the method shortly afterwards hit upon by the English chemists. In July 1910 it occured to Dr. Matthews to study the action of sodium upon isoprene, so placing together these two substances in a tube he sealed it up and went away for a summer holiday. During his absence the isoprene, grateful perhaps for a respite from the violent treatments to which it had been so long subjected, allowed itself to become condensed to rubber, and the first important stage of the attack was accomplished.

The production of isoprene now became the dominating subject. First thoughts of course centred on turpentine, from which it had previously been obtained by Tilden, as a raw material. Further consideration however soon put this out of court, on account of the limited supply, of the wide fluctuations in price, and of the indifferent yields obtainable from it.

Any substance to be practicable as a raw material for rubber must be cheap and obtainable in enormous quantities, and must furthermore offer the possibility of production of the finished product at not more than 1/- per pound. Regarded from this standpoint the only substances worthy of consideration seemed to be coal, petroleum and starch.

From coal of course is produced coal tar, that universal provider to the organic chemical manufacturing industry, but this did not appeal to the English chemists as a likely starting out point. Their German rivals on the other hand, with greater fidelity, selected tar to work from and are now obtaining isoprene from it though in what quantities and with what degree of readiness has not been made public.

Petroleum was next considered and numerous experiments made with it but not with promising results.

There remained now only starch, and this being cheaply convertible by fermentation into lactic acid this line of research was investigated, with the result that although with great ingenuity a way of converting lactic acid into isoprene was discovered yet the series of reactions by which it is accomplished is so complicated as to be utterly impracticable as a commercial proposition.

How else then could starch be turned to service? It can readily be changed into sugar, as is generally known, and this in its turn can be fermented and give rise to various products, the chief and best known of which is alcohol, and amongst them being fusel oil—a mixture of " higher " alcohols.

Now these higher alcohols, for various chemical reasons, seemed to form a promising base for further advance, and also it did not seem unlikely that improved means for obtaining them could be devised. So it proved. Taking for instance one of the amyl alcohols, $(CH_3)_2$ CH. $CH_2$. $CH_2$ OH, it was converted by the action of hydrochloric acid into amyl chloride, $(CH_3)_2$ CH-$CH_2$ -$CH_2$ Cl, this by treatment with chlorine into a dichloride, $(CH_3)_2$ CH. CHCl. $CH_2$ Cl., which when passed through a heated tube containing sodalime gave the hoped-for isoprene $\begin{matrix} CH_2 \\ CH_3 \end{matrix}$ = C. CH =$CH_2$.

On these results a bacteriologist, Professor Fernbach, of the Pasteur Institute, was invited to join the group with a view to improving the means by which fusel oil is obtained, and after 18 months work his efforts resulted in the discovery of new fermentation processes, affording a cheap method of obtaining acetone, a substance of great importance to the explosive and other industries, and of butyl alcohol. which when treated in the way described above affords butadiene and butadiene rubber. The isoprene yielding alcohol has apparently not yet been obtained in quantity and work in this direction is proceeding.

From the yield as since given for each stage of the process it would appear, that the resultant one, of rubber from potato, the source of starch, is not more than 8%, from which it may be calculated that to displace one acre of land under rubber cultivation nearly half an acre under potato would be required—of the high priced lands of Europe presumably. Hardly a satisfactory economic basis for the new industry to rest on one would think.

Such is an outline of the story detailed by Professor Perkin, and the time having arrived when work on a larger scale became necessary an appeal for funds had to be made, conditions in the British chemical industry being such that no capital is available for experimental work.

The proposition, although based on the to all appearances sound prospects of being able to supply the worlds demand for both acetone and fusel oil, seems to have met with less support than one, say, for growing rubber in the Sahara would be expected to receive.

Criticism, directed mainly towards the slaying of the project, and ignoring that the question of rubber manufacture was declaredly only in an experimental stage, was focussed on the points that the process described was for butadiene-not isoprene-rubber, that only insignificant quantities had been made and no vulcanisation experiments carried out, that no information given justified the estimate of 1/-per lb. as the probable cost of production, and that in any case no synthetic rubber could be expected on the market for some years to come.

True though all this may be it must not be supposed that the matter is disposed of even if the English group does fail to obtain the requisite funds. It is evident from the numerous patents being taken out that great activity on the subject prevails in the German laboratories, and that the main efforts of the Bayer Co—with its 300 trained chemists—and of the Badische Fabrik, of indigo fame, are directed to the overcoming of the difficulties that at present stand in the way of rubber manufacture.

Professor H. E. Armstrong, writing in the Times of July 17, emphasises this, and deprecates the excessive jubilation of the English chemists. He points out that it is doubtful whether the fermentation processes can be adequately protected by patents, that probably agents other than sodium will be found to effect the polymerisation of isoprene, and that in fact there is reason to believe that the German firms even now have at their disposal information that renders them independent of the Perkin group. When they obtain a satisfactory process it will be a small matter, considering the enormous fund of technical experience they possess and the capital at their command—the Badische Fabrik laid down one million sterling in the developing of the indigo synthesis—to organise a manufacturing industry on a huge scale.

An eminently sane article is concluded....."It is of the utmost importance that the production of natural rubber should be made a scientific industry. In the case of indigo the margin in favour of the artificially made material is not so very great; had the planters taken time by the forelock it is not improbable that they would have held their own. It will be well if rubber planters take the lesson of indigo to heart and learn without delay to set and keep their house in perfect order."

Nothing sounder than this can be said on the subject. Synthetic rubber's most vulnerable point will undoubtedly be in its mechanical properties after vulcanisation. It will be to high class

natural rubber as is shoddy to silk,—but it will be necessary to be able to demonstrate clearly and decidedly from the beginning that it *is* shoddy.

Present methods of valuation will not suffice, methods by which rubbers differing widely in their practical qualities fetch the same price, by which "crepe" for instance sells for more than the certainly superior "smoked sheet." As long as "prettiness" continues to be the chief criterion there is little reason why synthetic should not enter the market on equal terms with natural rubber.

Buying then must be made on the basis of the mechanical tests afforded after vulcanisation—no reliable means of valuing raw rubber having as yet been devised—and, as trade conditions prevent the buyer from undertaking these, they must be furnished by the seller. Either actual figures could be given with the consignment or a guarantee that it complies with standard tests.

This would constitute one step—a momentous one—in the scientific organisation of the industry advocated by Professor Armstrong.

But there are others—no less important. As yet the number of scientific workers engaged on the many problems that require attention can be counted almost on the figures of one hand. Worse still, none knows what his fellow-workers are doing. At any time it may happen that two or more are carrying out independently the same work, halving at least the potential capacity for progress.

Surely this is a lamentable waste, the labourers being so few? The production of a uniform product of the highest attainable quality, is the ideal to be aimed at, and this can only be reached by patient and laborious experiment and by adopting the principle that knowledge gained and progress made must be thrown into the common stock.

Laudable as may be the ambition of each of the hundreds of estates to make a name for its own particular brand, the futility of the endeavour must be obvious. Which buyer would care to know what *seringueiro* made the Para he is purchasing?; and what estate gets a farthing more for its rubber because its neighbour is less successful?

Certain it is that were first plantation rubber of one quality, and that the best, there would not be the difference that prevails to-day between its price and that of "fine hard Para" (equivalent to about 9d per lb). To those who assert that "plantation" will always be able to undersell "synthetic" let us admit the fact, but point out that a decrease of 1d per lb. in selling price means, or soon will mean, a loss of £300,000 a year to the industry, and that to have to resort to underselling would involve the throwing away of millions.

It is of the utmost importance therefore that the advent of "synthetic" on the market should be prevented if possible from bringing about *any* fall in price.

From this point of view then it is of urgent necessity that a policy of taking no risks be adopted, and that the scientific organisation of the industry be developed as well as is humanly possible.

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## THE SAGO PALM.

By L. C. Brown.

The Sago Palm thrives exceedingly well in Malaya and may be found all through the Federated Malay States though it is most plentiful perhaps in Perak and Negri-Sembilan among the padi lands and the low-lying lands near the Perak River belonging to the Natives. In the Kuala Pilah District, Negri-Sembilan, nearly all the native houses are roofed with the Sago attap.

The palms are generally seen scattered about in small patches and up to the present no one appears to have taken up this cultivation and planted the palm on a large and systematic scale. This is the more surprising, considering that there are large areas where the palm would do very well and where it is practically impossible for any other kind of tropical product to be grown with any chance of profit. These lands may be described first as miry and very swampy land; also there is in many places land where padi has been tried again and again and failed and this is at present abandoned and has grown upin blukar.

Further I would call attention to the many swamps or Pyahs to be found on several of the Rubber Estates which are also admirably suited for the growth of the Sago Palm and I feel sure it might be planted here with success, as the attaps alone obtainable from the palms in a few years time should of themselves prove quite a valuable asset.

As regards this I may state that attap made from the Sago palm is in every way far superior to that of the Nipa palm now commonly in use; in fact, the latter seems as time goes on likely to become each year more and more inferior in quality. I can remember long ago when the Nipa attap would last for 5 or 7 years without having to be renewed, while at the present time it is fortunate if the attap will last as long as 2 to 3 years. This I believe is entirely due to the large demand, in order to meet which the leaves of this palm are now being cut at a much younger age than in previous years. The result is that the leaves have not the same stability and endurance which the older leaves had. The mere fact that the Sago attap commands a much higher price than the Nipa attap is of itself good proof of its distinct superiority and if

it were grown on a sufficiently extensive scale it would, I believe, practically oust the Nipa attap altogether. It does not deteriorate to the same extent and the extra price paid for this high standard of attap is more than compensated for on account of the width the attap can be placed apart in roofing, thereby requiring less labour and material, and again from the fact that it lasts for a period of 6 to 7 years without requiring to be renewed.

The palm, though handsome, is comparatively small in stature and appears in its early stages as a large cluster of leaves. After about 5 to 6 years if the plant is grown under favourable conditions the leaves can be cut and used for making attaps and a few years later the stem should be sufficiently grown to allow the pith which is contained inside of it to be extracted. This forms a farinaceous food which is made into Pearl Sago, Sago and Sago flour and in most countries the palm is grown almost entirely for this produce. Curiously enough, however, the Malays in the F. M. S. who cultivate the palm do not appear to take any trouble to make any use of this valuable nutriment although on one of my visits to Kuala Pilah I was informed that they do occasionally feed their ducks with it. While I was in charge of an Estate in Penang I found no difficulty in selling the mature stems to the Chinese from $2/- to $3/- per stem for the purpose of making Pearl Sago, by no means an expensive or difficult process.

In "Tropical Agriculture" by F. L. Simmonds, the author has written at some length about this palm of which there are three distinct species, but nothing is said with regard to its cultivation nor can I find any reference to it elsewhere. I can therefore only offer my own experience about this.

The Government some time back allowed me to make a small trial of this palm; but owing to the land which was selected for the purpose being afterwards found unsuitable, although I managed to get all the land planted up, the experiment was subsequently abandoned though in some respects it could not be called altogether a failure.

The general practice of the Malays is to grow the palm from "Suckers" which, unless there are plenty of plants in the immediate vicinity, is both a costly and an unsatisfactory method, and the more so if grown on anything like a large scale. My experience taught me that unless the "Suckers" are most carefully taken from the parent tree, and I found this was very rarely the case, they will not survive after being planted out; and generally the cost of procuring them, especially if they had to be brought from any distance was very expensive and the result most disappointing.

The advantage to be gained on the other hand by propagating the seed in nurseries and afterwards planting out the seedlings when about 1 to 1½ year old is very great; for, not only does it

mean an immense saving in expense but the results themselves should prove to be far more satisfactory.

Care should be taken in the selection of the seeds, which can be purchased very easily and should be planted out about 1 foot apart on slightly raised land prepared in a similar way to padi nurseries. In about 6 months from the time my nurseries had been made I had 25000 to 30000 quite healthy young plants. Unfortunately shortly afterwards, owing to an abnormal flood, the selected land being near to the river, nearly all the plants were destroyed, but not before I had conclusive proof that the palm can be most successfully propagated from seed.

The cultivation of the palm itself is simple enough, and in opening up the area for the purpose the secondary growth of low forest and "blukar" should be cut down and burnt off as far as possible. When this has been done the holes for placing the "Suckers" or "Seedlings" should be dug at even distance not less than 15 feet apart and filled up again as soon as the planting is finished. The Seedlings, in my opinion, should be a year to a year and a half old before being taken from the nursery, more especially if the ground is very swampy and likely to be flooded for a short time. While planting the "Suckers" the roots attached to them should be disturbed as little as possible, and precaution should be taken to see that these are all properly covered in at the time they are being placed in the pits. For 18 months at least, perhaps 2 years, the plants should be circled round from time to time, the grass cleaned up and the blukar if grown up should be sufficiently cut down and cleared to prevent it from interfering with the growth of the palms. After this period, the condition of the land being favourable, the plants should make good progress themselves without any further attention.

From the foregoing remarks perhaps some of the Planters who have waste land of the nature I have described on their Estates might be induced to give the Sago palm a trial, as I believe the extension of this cultivation would be productive of good results and would further add to the agricultural value of land in the Federated Malay States.

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## PRELIMINARY NOTES ON TAPPING EXPERIMENTS AT KUALA LUMPUR.

By F. G. Spring.

The land on which these experiments were conducted was under cultivation for many years, previous to it being planted up with Rubber. This has in all probablity curtailed the growth of the trees as they are seven years old and are only on an average 21

inches in girth measured 3 feet from the ground; this datum was taken at the commencement of the experiment. The experiments are adjacent to each other and the trees under similar conditions, the slope, drainage, and nature of the soil being practically the same in each section. This is extremely important as any of these factors would have a tendency to affect the yield of latex. For the same reason the gouge knife was used in each plot.

The experiments were under careful supervision both as to the depth of the cut and the quantity of bark removed in a given time, the latter being examined every month and directions issued as to whether the bark removed was in excess or otherwise. In this way it was possible to complete the tapping of the surface in each experiment almost at the same time. In marking out the trees care was taken to have the outer vertical guiding lines dividing the tapping surface of each tree into quarters or halves as required and to have them as shallow and narrow as possible, distinct enough to show the extremities of the cuts but not deep enough to interfere with the passage of food material. The cuts were made parallel to each other and as far as possible, kept so. Each cut was carried at the same depth, to the outer guiding line and there made to end bluntly. Coolies unless they are very carefully watched are apt to make the cuts slope out to the surface of the bark before reaching the end of the cut. This result is the loss of a considerable amount of latex. The labour employed was Tamil, one coolie being in charge of one experiment, namely 65 trees. On account of the small number of trees alloted to each coolie the men were able to tap most carefully and get the maximun amount of latex. No water was put in the latex cups but a few drops placed at the top of the cuts to induce a better flow.

The distance of planting is 16 feet by 16 feet. Fortunately no trees were lost by disease.

In each experiment tapping areas were so marked out that the circumference of each tree should be completely tapped in 4 years, thus allowing 4 years for bark renewal. The trees tapped every day have half as many cuts as trees tapped each alternate day.

It will be seen from the tables that the half herring bone with superimposed cuts of 18 inches, tapped every day gave a considerablys larger yield of latex than any of the others, while opposite quarter tapped on alternate days gave a poorer yield than any of the other systems.

It is noticeable in the experiments that the trees tapped every day, in each case, gave a larger yield of total rubber than those tapped on alternate ays. The difference in the yield of scrap is particularly evident.

In experiments 1, 3, and 5, in which the trees were tapped every day the results obtained are not perhaps strictly comparable,

because where as in experiment 1, the tapping cuts have extended at the end of the years experiment to the base of the tree, in 3, and 5, the upper 18 inches only have been tapped, consequently in the two latter cases there remains an untapped area of bark at the base of the trees, which according to what is generally supposed give a bigger yield of latex than any other part of the trunk. When however the results of the 2nd year's tapping are obtained, it will be possible to draw more accurate conclusions as to the relative yield of the different systems. The 2nd year's results will be obtained in the course of a few months and will then be published.

In each experiment there is generally speaking an increase in yield of latex as tapping progressed. This of course is in accordance with what has been generally supposed to obtain.

The rainfall in the tables was taken from the Kuala Lumpur General Hospital record, the Hospital being at a direct distance of under one mile from the Experimental Plantations. In future experiments the records quoted will be those obtained at the Experimental Plantation.

The amount of Rubber, Scrap, and Shavings recorded in the tables are their dry weights.

## EXPERIMENT I.

### System of tapping Quarter (Half Herring bone). Two cuts 18 inches apart, Twenty cuts to the inch, Everyday Tapping.

| Month. | Latex Rubber. | | Scrap Rubber. | | Bark shavings. | | Rainfall. | No. of Trees. |
|---|---|---|---|---|---|---|---|---|
| | lbs. | ozs. | lbs. | ozs. | lbs. | ozs. | inches | |
| Feb., 1911. | 3 | 7 | 1 | ½ | | | 1.58 | |
| March ,, | 4 | 2½ | 1 | 4 | | | 10.88 | |
| April ,, | 3 | 1 | 1 | ½ | | | 15.89 | |
| May ,, | 7 | 2 | 1 | 6½ | | | 3.04 | |
| June ,, | 6 | 1½ | 1 | 10 | | | 1.97 | |
| July ,, | 6 | 5 | 1 | 14 | | | 2.43 | |
| August ,, | 12 | 11½ | 2 | 3½ | | | 6.05 | |
| Sept., ,, | 14 | 13½ | 2 | 2 | | | 7.05 | |
| October ,, | 16 | ½ | 1 | 9½ | | | 16.77 | |
| Nov., ,, | 18 | 00 | 2 | 1 | | | 12.25 | |
| Dec., ,, | 18 | 7 | 2 | 5½ | | | 11.06 | |
| January 1912. | 14 | 15 | 2 | ½ | | | 4.76 | |
| Totals ... | 125 | 2½ | 20 | 9½ | 11 | 13½ | | 65 |

## EXPERIMENT II.

**System of tapping Adjacent Quarters, Full Herring bone Two cuts 18 inches apart on each quarter. Twenty cuts to the inch, Alternate day Tapping.**

| Month. | Latex Rubber. | | Scrap Rubber | | Bark shavings. | | Rainfall. | No. of Trees. |
|---|---|---|---|---|---|---|---|---|
| | lbs. | ozs. | lbs. | ozs. | lbs. | ozs. | inches | |
| Feb., 1911. | 4 | 1 | 0 | 8½ | | | 1.58 | |
| March ,, | 4 | 1½ | 0 | 11½ | | | 10.88 | |
| April ,, | 5 | 15 | 0 | 12 | | | 15.39 | |
| May ,, | 9 | 2½ | 0 | 14 | | | 3.04 | |
| June ,, | 6 | 1 | 1 | 5 | | | 1.97 | |
| July ,, | 7 | 15½ | 1 | 6 | | | 2.43 | |
| August ,, | 8 | 9½ | 1 | 10½ | | | 6.05 | |
| Sept., ,, | 7 | 9½ | 1 | 4½ | | | 7.05 | |
| October ,, | 10 | 11½ | 1 | 4½ | | | 16.77 | |
| Nov., ,, | 12 | 5½ | 1 | 6 | | | 12.25 | |
| Dec., ,, | 11 | 9 | 1 | 4½ | | | 11.06 | |
| January 1912. | 11 | 10½ | 1 | 5½ | | | 4.76 | |
| Totals ... | 99 | 12 | 13 | 12½ | 12 | 3½ | ... | 65 |

## EXPERIMENT III.

**System of tapping-Single, V, 36 inches from base of tree. Twenty cuts to the inch, Everyday Tapping.**

| Month. | Latex Rubber. | | Scrap Rubber. | | Bark shavings. | | Rainfall. | No. of Trees. |
|---|---|---|---|---|---|---|---|---|
| | lbs. | ozs. | lbs. | ozs. | lbs. | ozs. | inches. | |
| Feb., 1911. | 3 | 13½ | 1 | 1½ | | | 1.58 | |
| March ,, | 3 | 4 | 1 | 3½ | | | 10.88 | |
| April ,, | 3 | 12½ | 1 | 4 | | | 15.39 | |
| May ,, | 6 | 8½ | 1 | 7½ | | | 3.04 | |
| June ,, | 6 | 12 | 1 | 12½ | | | 1.97 | |
| July ,, | 7 | 7 | 2 | 5½ | | | 2.43 | |
| August ,, | 9 | 9 | 1 | 15½ | | | 6.05 | |
| Sept., ,, | 8 | 11½ | 1 | 10½ | | | 7.05 | |
| October ,, | 9 | 4 | 1 | 13 | | | 16.77 | |
| Nov., ,, | 11 | 5 | 1 | 11½ | | | 12.25 | |
| Dec., ,, | 12 | 1 | 1 | 13 | | | 11.06 | |
| January 1912. | 11 | 5½ | 1 | 14 | | | 4.76 | |
| Totals ... | 93 | 13½ | 20 | 00 | 12 | 4½ | ... | 65 |

## EXPERIMENT IV.

**System of tapping-Double V, cuts 18 inches apart. Twenty cuts to the inch, Alternate day tapping.**

| Months. | Latex Rubber. | | Scrap Rubber. | | Shavings Bark. | | Rainfall. | No. of Trees. |
|---|---|---|---|---|---|---|---|---|
| | lbs. | ozs. | lbs. | ozs. | lbs. | ozs. | inches. | |
| Feb., 1911. | 3 | 3½ | 0 | 10½ | | | 1.58 | |
| March ,, | 3 | 4½ | 0 | 9½ | | | 10.88 | |
| April ,, | 5 | 9½ | 0 | 8½ | | | 15.39 | |
| May ,, | 7 | 15½ | 0 | 15 | | | 3.04 | |
| June ,, | 7 | 2½ | 1 | 6½ | | | 1.97 | |
| July ,, | 6 | 12½ | 1 | 6 | | | 2.43 | |
| August ,, | 9 | 12½ | 1 | 8½ | | | 6.05 | |
| September , | 8 | 2 | 1 | 3 | | | 7.05 | |
| October ,, | 10 | 1½ | 0 | 14½ | | | 16.77 | |
| November ,, | 10 | 7 | 1 | 2½ | | | 12.25 | |
| December ,, | 10 | 1 | 0 | 15½ | | | 11.06 | |
| January 1912. | 13 | 5 | 1 | 2½ | | | 4.76 | |
| Totals ... | 95 | 13 | 12 | 6½ | 12 | 15 | | 65 |

## EXPERIMENT V.

**System of tapping-opposite quarters. One cut of 36 inches on each quarter. Twenty cuts to the inch Everyday tapping.**

| Month. | Latex Rubber. | | Scrap Rubber | | Bark Shaving. | | Rainfall. | No. of Trees. |
|---|---|---|---|---|---|---|---|---|
| | lbs. | ozs. | lbs. | ozs. | lbs. | ozs. | inches. | |
| Feb. 1911. | 3 | 9½ | 1 | 3½ | | | 1.58 | |
| March ,, | 2 | 7 | 1 | 10 | | | 10.88 | |
| April ,, | 3 | 5 | 1 | 1½ | | | 15.39 | |
| May ,, | 5 | 6½ | 2 | 1 | | | 3.04 | |
| June ,, | 4 | 9 | 2 | 6½ | | | 1.97 | |
| July ,, | 5 | 3 | 2 | 4½ | | | 2.43 | |
| August ,, | 9 | 5½ | 2 | 7½ | | | 6.05 | |
| September,, | 7 | 12 | 2 | 1 | | | 7.05 | |
| October ,, | 9 | 1½ | 1 | 14 | | | 16.77 | |
| November,, | 13 | 2 | 1 | 14 | | | 12.25 | |
| December ,, | 11 | 8½ | 1 | 11½ | | | 11.06 | |
| January 1912. | 15 | ½ | 2 | 0 | | | 4.76 | |
| Totals ... | 90 | 6 | 22 | 11 | 15 | 15½ | | 65 |

## EXPERIMENT VI.

**System of tapping-opposite quarters. Two cuts of 18 inches apart on each quarter. Twenty cuts to the inch, Alternate day tapping.**

| Month. | Latex Rubber. | | Scrap Rubber. | | Bark Shavings. | | Rainfall. | No. of Trees. |
|---|---|---|---|---|---|---|---|---|
| | lbs. | ozs | lbs | ozs. | lbs. | ozs. | inches | |
| Feb. 1911. | 2 | 13½ | 0 | 12½ | | | 1.58 | |
| March ,, | 2 | 7½ | 0 | 13 | | | 10.88 | |
| April ,, | 1 | 13½ | 0 | 15½ | | | 15.39 | |
| May ,, | 4 | 10 | 1 | 7½ | | | 3.04 | |
| June ,, | 3 | 10½ | 1 | 11 | | | 1.97 | |
| July ,, | 2 | 11½ | 1 | 12½ | | | 2.43 | |
| August ,, | 5 | 7 | 1 | 11½ | | | 6 05 | |
| September,, | 9 | 6 | 2 | 0 | | | 7.05 | |
| October ,, | 12 | 6 | 1 | 8 | | | 16.77 | |
| November ,, | 10 | 6½ | 1 | 4½ | | | 12.25 | |
| December ,, | 9 | 6 | 1 | 5 | | | 11.06 | |
| January 1912. | 9 | 4½ | 1 | 7½ | | | 4.76 | |
| Totals ... | 74 | 6½ | 16 | 14½ | 15 | 11 | | 65 |

| No. of Experiment. | No. of Trees. | Average girth 3 ft. from ground. | Length of time tapping. | Latex Rubber. | | Scrap Rubber. | | Bark shavings. | | Total Rubber. | | Tapped. | System |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | lbs. | ozs. | lbs. | ozs. | lbs. | ozs. | lbs. | ozs. | | |
| 1. | 65. | 20½ inches. | One year. | 125 | 2½ | 20 | 9½ | 11 | 13½ | 157 | 9½ | Every day. | Half herring bone 2 cuts 18 inches apart. |
| 2. | 65. | 20½ ,, | ,, | 99 | 12 | 13 | 12½ | 12 | 3½ | 125 | 12 | Alternate day. | Full herring bone 2 cuts 18 inches apart on each quarter. |
| 3. | 65. | 21 ,, | ,, | 93 | 13½ | 20 | 0 | 12 | 4½ | 126 | 2 | Every day. | Single V. 36 inches from base of tree. |
| 4. | 65. | 21⅕ ,, | ,, | 95 | 13 | 12 | 6½ | 12 | 15 | 121 | 2½ | Alternate day. | Double V. cuts 18 ins. apart. |
| 5. | 65. | 21⅗ ,, | ,, | 90 | 6 | 22 | 11 | 15 | 15½ | 129 | ½ | Every day. | Opposite quarters one cut of 36 inches on each quarter. |
| 6. | 65. | 21½ ,, | ,, | 74 | 6½ | 16 | 14½ | 15 | 11 | 106 | 15 | Alternate day. | Opposite quarters 2 cuts 18 inches apart on each quarter. |

## THE CARE OF POT PLANTS.

By J. Lambourne.

There are many details in connection with pots and potting that to some may seem unnecessary, yet they are very important if pot plants are to be grown successfully. In this country one often finds pots used that are unsuited for the particular plant grown in them; in the majority of cases they are too shallow for strong rooting subjects. Potting too is often done in a very haphazard manner, plants often being put into pots three or four sizes too large for them. They are then often watered as though they were aquatics instead of land plants; consequently one often sees a miserable little plant in a large pot, struggling for existence in a water logged soil. There are numerous other details equally important if pot plants are to be grown at all successfully.

*Pots*:—These should be stocked in various sizes from two inches to twelve or fourteen inches in diameter at the top, and where large specimen plants are required larger pots or tubs should be used. The majority of the pots made in this country are too shallow for strong rooting subjects such as Palms, Crotons, Salvias, Coleus, etc; while for Ferns, Selaginella, Orchids etc, they are well suited. The most convenient pattern of pot for growing plants and potting them on, is a pot of the same measurement in depth as it is in diameter at the top, tapering slightly to the bottom so as to allow the ball of earth to be removed without being broken. The series of pots used should all be of the same pattern as this makes moving on much easier than when pots are of a variety of patterns.

*Potting*:—This is a very important part of the routine of garden work and should receive a good deal of attention if good plants are required for decorative or other purposes. The work varies with numerous subjects grown, as do also the requirements of different plants. Some need very firm while others need only moderately firm potting; and again some like small, and other large shifts, so one cannot lay down one rule for all plants as the requirements of plants differ widely one from the other.

The pot should be well washed and dried before using, as wet or dirty pots cause the soil in the former case and the young roots in both cases to stick to the sides of the pot. This is very inconvenient when the time comes for potting the plant into a larger size, because in getting the plant out the roots are sure to be injured even if the ball of soil does not break, which is highly probable when the roots stick very firmly. This is not a desirable state of affairs as in potting the plant from one pot to the other our object should be to avoid checking the growth of the plant; it can therefore be seen how important clean dry pots are in growing plants successfully.

As soon as seedlings are large enough to handle they should be potted singly into small pots or pricked out into other seed pans. They should not be allowed to get too large before they are potted or they will feel a check. They should be potted at first into say 2½ inch pots and as they fill these with roots they should be potted into large ones until they have reached the desired size. Cuttings may be treated in the same way; they should be removed from the pot in which they are struck as soon as they have made roots about one-eighth of an inch long. They can then be removed without injury to the rootlets. This applies where cuttings are struck several round the edge of a pot; a better method however is to strike them in say two inch pots if room can be spared. They can then be potted on as an established plant when the pot is filled with roots.

Pots should be well drained by placing a piece of broken pot over the drainage hole, hollow side downwards, and placing others around and over it to the depth of a half an inch in small pots, and increasing to about an inch and a half in the large ones. Rough soil should be placed over these to prevent the finer particles getting among the crocks and stopping the drainage.

The plant should then be placed in the pot so that the top of the ball is a shade below the soil when the pot has been filled to the desired height. This should vary with the size of the pot from a half to one, inch or even one and a half inches in the largest sizes, below the rim of the pot. The soil should be pressed down round the ball of roots so as to make it firm; a stick is very handy for this as the soil is then pressed to the bottom. A very common fault in potting plants on is what is known as "hanging the plant", that is pressing the soil round the top firmly and leaving the hollow at the bottom; this applies more particularly to plants that only require small shifts. Before potting plants on, see that the ball of roots is well moistened through, as if dry when potted it will probably remain so unless it is soaked in water after potting, which is not desirable.

Some plants require firm while others only require moderately firm potting. Such plants as Palms, Crotons and in fact all hard wooded plants belong to the former class while Ferns and herbaceous plants generally may be placed in the latter.

*Soils*:—The soil composition for potting varies with the different subjects. A good soil for Palms, Crotons, Salvias etc, is good fibrous turfy loam three parts, leaf mould one part, and sufficient sharp sand to make the whole porous. A little dry cow manure may be added to this for all pottings after the first, in this way better plants may be grown in small pots. Ferns like a soil with a good proportion of humus, leaf soil should therefore be added, say half turfy

loam and half leaf soil with a little dry cow manure and sufficient sand to keep the soil porous.

*Watering*:—This should be done preferably in the morning and evening, but if the plant is suffering at any time duringthe day it should be watered. Take care not to wet the foliage while the sun is shinning hot upon it or burnt foliage may be the result. Watering is often done in a careless manner giving the plants water at both morning and evening time irrespective of whether they are dry or not. This often causes a waterlogged soil and consequently a poor plant owing to the roots being suffocated. If the plant has been potted properly, a good test to see if the plant is dry is to tap the pot, either with a piece of stick or the knuckle of the finger; if the pot gives out a hollow sound the plant requires water. Plants that have filled the pots with roots may be improved by giving them a little liquid manure once or twice a week. Bullock and goat manure are quite good for this purpose, if soaked in water for a time. The liquid should be diluted to about one part in 4 to 8 of water according to its strength, and the plant dealt with; Palms etc will bear a stronger solution than Ferns or soft plants providing they have well filled their pots with roots.

J. L.

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## NOTES ON INVESTIGATIONS OF PLANT DISEASES IN THE FEDERATED MALAY STATES DURING 1911.

By Keith Bancroft.

(*continued*)

### PARA RUBBER.

#### Leaf Diseases.

Only two parasitic fungi have been recorded, viz. *Phyllosticta Heveae*, Zimmermann, and *Pestalozzia Palmarum*, Cooke. The damage done by these two fungi is very small.

A sooty mould, *Limacinula javanica*, v. Hohnel, has been recorded as following on a scale, *Lecanium nigrum*, on the leaves of the plant. The fungus has been known on coffee in Java. Such fungi live on the honey-dew deposited on the leaves by the insects; consequently if the trees are kept free from the insects the fungi would not appear. The fungi do not extract any food from the leaves, although they may be expected to arrest the growth more particularly of young plants.

#### Other Fungi Occuring on the Para Rubber Plant.

This includes some of the commoner fungi which have been found on the plant and which are regarded as harmless, occuring on dead parts produced by wounding, fire or natural causes.

*Schizophyllum commune*, Fries, a small, white, fan-shaped fungus, frequently aggregated in numbers, each measuring about one half of an inch in width; occurs on dead trunks or parts of trunks or dead branches of *Hevea*, and also commonly on dead timber, posts in sheds etc. Malay name—*Chendawan kukor*.

*Daldinia concentrica*, Ces. and De Not., chocolate-coloured, forming hard, globular masses about 1 or 1½ inches wide. Occurs on wounded parts and on dead trunks. Malay name—*Chendawan jemput-jemput*.

*Polystictus sanguineus*, Mey.; a scarlet, bracket fungus occuring on dead trunks; very common in recent clearings on fallen logs. Malay name—*Chendawan biring*.

*Hirneola polytricha*, Mont., a thin, dark-coloured fungus producing clusters on dead branches or wounded parts.

*Megalonectria pseudotrichia*, Speg., a bright red, minute fungus forming small round bodies of the size of pin's head; occuring on dead bark.

*Oospora gilva*, Sacc. and Vogl., a pink powdery fungus occurring on burnt parts; known as *Bunga api* by Malays.

*Xylaria cynoglossa*, Cooke., a pale-coloured tongue-shaped fungus measuring about 4-5 inches in length, found on a dead root of the plant.

*Nectria diversispora*, Petch, a small salmon-coloured fungus occurring on dead bark or fruits.

*Stilbella Heveae*, Zimmermann, a minute pin-shaped fungus with a salmon-coloured head and dark-coloured stalk, occuring on dead bark. The two last-named fungi, *Nectria diversispora* and *Stilbella Heveae*, have been supposed to be parasitic; but work carried out by by Petch in Ceylon on the former and in this country on both species would indicate that they are not capable of inducing disease, but only appear secondarily on dead parts. The *Nectria* frequently occurs on dead fruits of *Hevea* in this country.

## Other Effects on the Plant.

Under this head will be described several effects which are considered to be attributable to other causes than parasitic organisms.

i. The death of the lower branches of trees ranging in age from six years and upwards was fairly general throughout the country in 1911. During the dry weather many of these branches died off rapidly, and the phenomenon appeared to cause some anxiety. The death of these branches appears to be in no way connected with disease. From about the sixth year onwards, the age varying with the distance of the trees apart from each other, the trees commence to shed lower branches and frequently large branches are cast off. Their leaves turn yellow or brown and fall, and death occurs gradually. All such branches as are shaded by the expansion of the

parts above eventually succumb to this fate. The phenomenon appears to be a process of self-pruning. During the dry weather the death of these branches occurred somewhat rapidly, and it is considered that their rate of death was accelerated by the drought. The dead branches become covered with fungi of different kinds and are attacked by boring beetles. The die-back fungus, although it is in no way associated with the cause of death of the branches may come on the dead branches and pass from them to the living trunk of the tree. It has been recommended that these branches should be cut off flush with the trunk and tarred.

ii. Several effects of apparently different kinds have been observed on the bark of the trunk. The commonest is that in which limited areas of bark die and fall away leaving the wood exposed. Large wounds may thus appear, consisting of the exposed wood and a lip of renewing tissue around it. A definite recovery appears to take place, and the wound heals. The effect appears to be in no way caused by previous injury. It requires investigation.

During the early part of the year the death of newly-tapped bark was particularly common on one estate where more than 1,500 trees were effected. Sunken areas first appeared on the recently-tapped surface for about a vertical distance of one or two inches above the tapping cut. These areas fused together and a patch or strip of dead bark resulted, stretching sometimes for the whole length of the tapping cut; the under-lying wood was discoloured for some short distance inwards. Investigations failed to show that the trouble was due to an organism. Petch has described a similar effect from Ceylon and has attributed it to the collection of an excess of water on the newly-tapped surface. With the advent of dry weather and the suspension of tapping operations the trees recovered, the only loss being occasioned by the entrance of boring beetles into some of the trees.

Another form of death of the bark on the trunks of trees occurred in the case of three adjacent trees on one estate. The bark became separated from the wood by the death of the cambium and could be removed in large masses. The trees were five years old. There was no evidence of any previous injury and an examination failed to show the presence of any organisms which could be regarded as parasites. The trees were removed before further progress of the trouble could be observed.

Finally, on many estates on which timber has been burned off among the planted trees the bark is frequently scorched and killed, eventually falling away and leaving large areas of wood exposed.

iii. The death of the top shoots of trees of four or five years and more has been commonly observed. It occurs on exposed situations and appears in these cases to be due to wind, or it may occur on lowlying badly-drained land where it has been attributed

to deficient drainage. It is not unlikely that the fungus described above, *Phyllosticta ramicola*, may be responsible for the death of some of these shoots.

iv. The exudation of tears of latex from the branches is commonly caused by wind. The bending of braches produces a splitting of the bark and the latex exudes through the cracks. Bleeding is also not uncommonly associated with the pink disease. There have been, however, several instances in which large branches have shown tears of latex, and these could not well be attributed either to wind or to the pink fungus. The pecking of the branches by birds may be a cause of this; punctures by insects are also a possible cause. The presence of the tears of latex was originally supposed to be a symptom of the die-back disease, but it appears to be no indication of the presence of the *Diplodia* fungus.

v. *Fasciation.* Malformed shoots which take the form of straplike, flattened structurers have been frequently met with. The proportion of trees showing this effect is considerably under 1%. In some cases the structures are large and resemble a stag's antlers; in other cases they occur only as a small portion of a branch. The cause of this phenomenon is not known. It may in some cases be induced by a superabundance of food in plants, but this is obviously not the case in fasciated rubber trees, where fasciation of a single branch or even of a part of a branch is quite common, the other parts being normal. Another suggested cause is injury due to insects. The fasciated shoots of Para rubber usually yield quantities of thin, watery latex.

vi. *Burrs.* The nodular masses, which originate as small pea-like bodies and may eventually develop into large outgrowths, sometimes measurable by feet, frequently render tapping impossible. Such trees as are badly burred are sometimes cut out. The greatest damage from burrs is on old trees which have been badly tapped in previous years. A certain number, however, develop burrs on untapped areas of the trunk or before tapping has been commenced. The percentage of these latter trees is, however, not usually greater than 1% or 2%. There is little doubt that their formation may be stimulated by the wounding of the wood in tapping; but their development and production requires careful investigation.

## The Spotting of Plantation Rubber.

To conclude the investigations on organisms which were found to be associated with the Para Rubber Tree a brief note is given on the work which was carried out during the year on the spotting of prepared rubber.

Spots of different colours were observed on many plantations both on sheet and on crepe of different grades. During the drought of February and March the spotting was particularly abundant.

Towards the close of the year, however, it showed a considerable diminution in quantity and several estates which had previously turned out large quantities of spotted rubber were almost free from the trouble.

*Influence of the spots on market value and quality of the rubber*: It has been difficult to obtain accurate records of the influence of the spotted appearance of sheet and crepe on the market value of the product; but there appear to have been several instances in which the presence of spots in plantation rubber have lowered its market value. One would expect that since it is desirous that plantation rubber when placed on the market should be homogeneous in colour, as well as in its other physical properties, the presence of spots would detract from the market value of the product.

With respect to the influence of spots on the quality of the rubber there appears to be no deleterious influence from spotting. And, in view of the cause of spotting which will later be shown to be the presence of microoganisms, of fungus and bacterial nature, there would appear to be no reason why spotted rubber should be inferior in quality, the organisms presumably altering only the small quantities of proteid and carbohydrate material which are present in the rubber.

*Nature of the spots.* The spots are either of different shades of red, blue, black or yellow, while in some cases clear patches are present on sheet. They vary in size from large red flushes on sheet measuring about six inches across to small specks of one or two millimetres (1/25 or 1/12 of an inch) in diameter.

*Susceptibility to spotting.* Of the different kinds of rubber smoked sheet, smoked crepe, and vacum-dried crepe were never found to develop spots; steamed crepe was very susceptible to spotting and thicker crepe was generally more spotted than thinner crepe. Crepe was apparently more frequently spotted than sheet; but this might be accounted for by the comparatively small quantities of unsmoked sheet made in the Federated Malay States.

*Time of appearance of spots.* The spots made their appearance while the rubber was being dried, becoming evident at the end of eight or ten days or more after the rubber was prepared; in some few cases the spots were found to appear earlier. Scrap was found in some cases to develop a red colour on the trees before it was collected.

*Causes of spotting.* That spotting was caused by microorganisms was suggested both by Carruthers and by Ridley, the former considering that a fungus (*Syncephalis sp.*) was the cause and the latter attributing red spots to *Protococcus nivalis*, an alga which colours snow red in Europe.

Petch described a black spotting of wet biscuits in Ceylon and, by dissolving the rubber, found a black pigment and bodies like bacteria; he considered the pigment was due to the bacteria. In January 1911 Brooks described red spots on crepe in Sarawak and obtained in artificial culture a bacillus which he considered to be *Bacillus prodigiosus*, a red bacillus which inhabits tap and pool water. A red spotted sheet which was sent home by Sidney Morgan, Resident Chemist to the Rubber Growers Association in this country, was identified as being caused by *B. prodigiosus*.

Some examinations of spotted rubber which were made at the Department of Agriculture, by dissolving the rubber and leaving the residue, showed that in several cases hyphae or filaments of fungi were present; and the clear patches on sheet referred to above were sometimes situated under superficial growths of moulds on the rubber. Following on this, attempts were made to obtain organisms from the rubber by transfering freshly coloured portions of sheet, crepe and scrap to artificial media. Four fungi and one bacillus were thus obtained and the growths were in many cases pure. These microorganisms were cultivated pure and some of them have been used to inoculate biscuits of rubber. A red spotting was reproduced by one of the fungi, apparently *Monascus heterosporus*, and the same organism was again cultivated from the biscuits. Another fungus, appearing to be a new species of *Spondylocladium*, produced a dark blue or almost black spotting. A bacillus, *B. prodigiosus*, obtained both from sheet and scrap caused a profuse colouring on being introduced into latex before or after coajulation, the colour appearing in a single night. In addition to these the *Diplodia*-form, identical in appearance with the fungus which causes the "die-back" of Para rubber and a *Mycogone sp* were isolated from spotted rubber.

*Distribution of the organisms producing spotting.* The above fungi are reproduced by spores which may be disseminated in the air or carried by insects. The *Monascus* and *Spondylocladium* have been obtained from poles of green jungle wood used in drying houses for hanging crepe. The *Diplodia*-form is widely distributed through the Federated Malay States on dead plant material. The habits of the *Mycogone* are not known, but the other species of this genus are saprophytic moulds. The bacillus inhabits tap and pool water and its presence on scrap would indicate that infection can be derived by the use of pool water in the tapping cuts.

Other causes of discolouration are oil and dirt. Dark colouring may be produced by the oxidation of chemical bodies in the latex.

*Treatment.* It is evident from the above that since different causes may result in the spotting of prepared rubber it is essential that the cause of any particular spotting be determined before preventive measures should be employed.

Where the spotting was found to be due to *Bacillus prodigiosus* it has been recommended that the use of water in the cups be discontinued far as is possible, that the latex from the field which developed the spotting should be treated with formalin before coagulation and that every attempt be made to prevent the introduction of the bacillus into the drying-house on account of its rapid spread. Any rubber which develops this spotting should accordingly be removed from the drying-house as soon as the spotting appears ; and scrap which shows a red colour should be isolated or destroyed.

In the spotting which is caused by fungi it has been found that generally speaking conditions which tend to retard drying are favourable to the development of the spotting. For example, drying-houses which are placed in damp situations tend to produce much spotted rubber, and in one and the same drying-house rubber which is being hung in a protected corner, where it dries slowly, has on several occasions been found to be much spotted ; again, " steamed crepe " which takes a much longer time to dry than ordinary crepe appears to be very susceptible to fungus spotting, thicker crepe is apparently more susceptible than thin crepe, and " vacuum dried " crepe has never been observed to develop the spots. Accordingly, it has been recommended for this spotting that every facility be given to drying, that attempts be made where possible to ensure a good access of light and air to the drying-house and a good circulation of air within it, that the rubber be creped thin, providing it is convenient to do so, so as to ensure rapid drying, and that the drying-house be kept closed at night. Where the rapidity of drying has increased the number of spots has been found to diminish considerably and in some cases to disappear altogether. It is probable that recent developments which have been made in rapid drying may lead more or less generally to the adoption of drying by artificial means ; and this should lead to the disappearance of the spots.

Poles of uncured should not be employed for hanging rubber, owing to the fact that some of the fungi have been obtained on recently dead wood.

The spotted rubber should where possible be isolated as soon as the spots appear ; this has, however, met with considerable difficulty in very many cases owing to the absence of outside accommodation for the spotted crepe.

Smoking appears to prevent the spotting ; but this cannot be recommended for crepe in the present state of the market. Where crepe which has been previously spotted has been smoked it has been found that the spots are not obliterated, but are rendered less evident.

The employment of fungicides to prevent fungus spotting is scarcely likely to give satisfactory results owing to the limited number of fungicides which could be employed with plantation rubber and to the ease with which they are washed out during the preparation of crepe.

This concludes the notes on the organisms which were investigated in connexion with the cultivation of the Para Rubber Tree.

*(to be continued)*

## LAWN GRASSES, LAWNS AND THEIR TREATMENT.

By F. G. Spring.

*Digitaria didactyla (Blue Couch)*

Attention is called in the "Agricultural Gazette of New South Wales" of September, 2nd 1910, to a grass, known at Sydney as "Blue Couch". Further mention is also made of it in the "Kew Bulletin", No. 6. 1911., as being most suitable for lawn purposes.

Seeds of this grass were obtained from the Botanic Gardens, Sydney, in the latter part of 1911 and planted at Kuala Lumpur Experimental Plantations. The seed germinated quickly and in two months time the grass gave a good thick even covering over the ground. Little attention was given to the young plants other than watering them in dry weather. The grass has now been growing for the best part of one year and during this period no weeds have been seen amongst it. It would thus appear that the grass has an advantage over most others in being able to check the growth of other grasses and weeds growing amongst it. At present I can only speak as to the excellent covering it provides, its adaptability to the Malay soils and climate and the soft texture of the leaves, but I have no knowledge as to how it will wear when played on. A report by Mr. Ernest A. Bonney, of Longueville, Sydney, in the Kew Bulletin says:—

"After an experience of five or six years of this grass on my croquet lawn at Longueville on the Lane Cove River, my opinion is that it is much more suitable for bowling greens and croquet lawns in the coastal districts of New South Wales, especially in loamy or sandy soil, than the couch, which is so generally used around Sydney. My own lawn was made about nine years ago in dark sandy soil, the surface of which contained a considerable quantity of decayed vegetable matter. About a fourth part of the lawn was turfted, and the remainder planted with couch. About three years afterwards I noticed the Blue couch, but do not know where it come from, as I have not seen it about Longueville. It gradually spread

and now covers an area of 300 square feet, and is continuing beyond the boundary of the playing area, where it has an opportunity of running to seed. "The advantage of the grass over couch are as follows :—

i. "It is much less trouble to keep in order, as the leaves being soft and succulent, and, there being an absence of tough runners and the growth less rapid, the mowing during the summer months takes about a quarter of the labour.

ii. "The leaves being broader and the roots forming a thick fibrous mass, the surface is always well covered and stands more wear, as there are no bare places to be pitted into holes by the rain and wind. The leaves being of a soft texture it is unnecessary to grind the lip of a Green's lawn-mower, as much less resistance is offered to balls passing over it, and that resistance remain more even through out the day.

iii. "It eradicates all other grasses and weeds on my lawn. Wherever it appears the Couch disappears entirely, and at the present time (17th June), when what we call winter grass and many objectionable weeds are coming up in the couch, the parts covered with Blue couch are perfectly free from all other grasses

iv. "It stands the cold weather better ; it is still green and growing whilst the couch is looking brown and its growth has stopped. A severe frost turns it brown.

v. "It requires less top dressing, and is better without any, if there are no subsidences in a lawn. Only sufficient to level the surface should be put on, as it does not require fresh soil to feed upon. A little fertiliser is quite sufficient. The only objections that I know of are :— Firstly, it dies off sooner during a long term of hot dry weather ; but it recovers very quickly after rain, and as all lawns during such times have to be watered, it is only a matte of using a little more water, the cost of which is less than that of the extra labour required by Couch. Secondly, the colour of the grass, which is never a bright green, being a blue green in summer and yellow green in winter ; but as it is all one colour, this is preferable to the numerous tints which are so often found in a Couch lawn —especially during the winter."

*Cynodon dactylon* (*Bermuda grass*)

This grass is probably more used in Malaya for lawns than any other. It is largely found at road sides and paths, particularly where the soil is of a sandy or gravel nature. Its habit of growth renders it particularly suited to light sandy soils. Its chief characteristics are, its power to withstand heat and drought, and to revive quickly in wet weather. It makes one of the best lawns on account of its smooth and regular growth. Bermuda grass belongs to the order Gramineae and is a perennial.

Comparing this grass with Blue couch my experience is that the latter has an advantage in being able to check to a greater extent the growth of weeds. This is important as there is every opportunity for other grasses gaining a hold of the soil and thus entailing a considerable sum in eradicating them.

*Lawns.*

*Drainage.* After the land has been selected and levelled the next point to consider is drainage. On sloping lands there is generally sufficient, natural drainage, but on dead levels it is important that artificial drains be made, particularly where the sub-soil is of a clay nature. On level lands where the subsoil is exceptionally light sands or gravels, drains may be dispensed with, but as a general rule it is necessary to aerate the soil artificially. The distance apart of the drains depends upon the tenacity of the soil; the heavier the soil the nearer the drains have to be. On moderately light land, which is generally found here they may be made at intervals of 10 to 12 feet. Any hard material can be used for this purpose such as stones, ashes, or laterite.

*Preparation of the land.* The whole area should be chungkolled to a depth of one foot and as this is being done the larger stones removed and the weeds collected and burnt. The soil should then be enriched by an application of rich jungle mould and a small quantity of lime. This may be chungkolled into a depth of 4 to 6 inches. Next in efficiency to mould is bone dust or superphosphate of lime. The soil should be brought to a fine tilth by breaking up the surface lumps of earth, and left a few days exposed to the weather in order to render it soid. Previous to planting, the land should be relevelled, a top dressing of fine jungle soil applied and then well trodden down.

*Planting.* Probably the best way to plant is to dibble in plants six inches apart each way. The advantages of this system of planting over turfing are, it is less expensive and the grass you wish to plant is free from weeds which are usually introduced when turfing. When the grass is planted the land must be well rolled and watered.

*After Cultivation.* The most important care to be given to the lawn in the process of establishment is weeding. In dry weather the lawn may be watered every day before sunrise or after sunset. It is advisable to roll the grass as often as possible not only for the purpose of encouraging growth, but to keep the surface level. If the lawn is played on a good deal it may be necessary to close the court for a time, a top dressing, at this time, of fine jungle soil with a little lime will quickly stimulate growth. Such an application, if well rolled will greatly help to fill up any hollows which may occur on the lawn.

# HOW TO DISTINGUISH DIFFERENT ORDERS OF INSECTS IN THEIR VARIOUS STAGES.

By C. B. Holman-Hunt.

## Introduction.

It is often important to planters to be able to recognise Insects in the larval or immature stages as well as when they are "imagines" or mature, so I propose to write a series of articles dealing with this subject.

I must preface my remarks by pointing out that it is in the larval state that Insects feed mostly and grow. Although Insects may feed after they have become "imagines", they never grow then.

A normally winged insect, when the wings have attained their power of flight, is an "imago" (plural "imagines"). No "larvae" can fly.

The following is a very brief abstract of the position of the Insects in relation to other animals.

The Zoological Kingdom is divided primarily into two big sections :—

i. Animals consisting of one cell. (Protozoa)

ii, Animals consisting of several cells (Metazoa),

but it may here be noted that all the Metazoa start as a single cell which, usually after fusion with another cell, divides up first into masses of single cells and these in the higher forms of life become differentiated into groups called tissues fitted for their several functions.

The Metazoa are divided further into

(i) Those possessing no backbone (Invertebrata)

(ii) Those possessing a back bone (Vertebrata).

Insects, which possess no backbone, are included in the Invertebrata.

The Invertebrata are further divided into :—

i. Coelenterata consisting of animals containing inside one set of spaces which communicate with each other and with the exterior through the mouth.
Examples. Jelly Fish and Corals.

ii. Porifera resembling the Coelenterata in the above characteristics except that there are inhalent pores in the walls.
Example. Sponge.

iii. Annelida. Animals with more than one set of spaces fitted for their separate functions, segmented but without segmented limbs.
Examples. Worms and Leeches.

iv. Arthopoda. Segmented animals with segmented paired limbs. Spaces as in Annelida. Possessing a hard outer segmented skeleton.

Examples Crabs, Lobsters, Insects, Millipedes.

v. Mollusca. Unsegmented animals with spaces as above Without a segmented outer skeleton.
Examples Snails, Slugs, Cuttlefish.

vi Echinodermata. Animals radially symmetrical with a water vasculasystem.
Examples Sea urchins. "Tripang."

There are other divisions but they contain more or less scarce animals with no recognisable examples.

The Arthropoda are sub-divided into :—

i. Crustacea. Mostly aquatic (except woodlouse) with two pairs antennae or feelers in front of the head, at least three pairs of jointed jaws and numerous jointed legs.
Examples Crabs, Lobsters, Woodlice.

ii. Antennata. Arthropoda with one pair of antennae. These are divided into :—

A. Prototracheata. Including the rare Peripatus, a worm like creature with several short paired jointed legs and tracheae (= air tubes opening on the sides of the body).

B. Myriapoda. Arthropoda with tracheae, with several pairs of long jointed legs and with all the segments except the head alike.
Example. Millipedes.

C. Insects. With only three pairs of long jointed legs and with the segments forming the head, thorax (three segments) and abdomen (ten segments) sharply divided and usually with two pairs of wings originating from the second and third thoracic segments.
Examples. Butterflies, Moths, Beetles, Bugs.

D. Arachnida. With two or four pairs of long jointed legs and usually the segments composing the head and thorax fused and the abdomen separated in the Spiders and fused in the Mites.
Examples. Spiders, Mites.

To sum up, Insects are built up of several kinds of tissues with no internal skeleton but a more or less hard jointed external skeleton. They possess a single pair of antennae or feelers originating from the head, and three pairs of jointed legs. The body is divided into :—

i. Head carrying antennae, eyes and mouth parts.

ii. Thorax of three segments carrying below three pairs of legs and from the sides usually two pairs of wings.

iii. Abdomen without lateral or ventral appendages and containing digestive and generative organs inside.

Insects are divided into (according to the Cambridge Natural History).

i. Aptera. Wingless insects, with biting mouth parts. Undergoing a slight metamorphosis.
Examples. Bristle-tail, Silver fish (pest in books).

ii. Orthoptera. Forewing leathery, hind wings membranous, folded on repose like a fan. Biting mouth parts. Metamorphosis slight.
Examples. Crickets, Grasshoppers, Cochroaches.

iii. Neuroptera. Both pairs of wings narrow, membranous, net veined. Biting mouth parts, Metamorphosis more marked.
Examples. Termites, Dragonflies.

iv. Hymenoptera. Forewings larger than hindwings, all membranous. Forewings united to hindwings by a clasp. Biting and sometimes licking mouth parts. Metamorphosis marked.
Examples. Bees, Wasps, Ants.

v. Coleoptera. Forewings shell like. Hindwings membranous, larger. Biting mouth parts. Metamorphosis marked.
Examples. Beetles.

vi. Lepidoptera. Fore and hind wings membranous covered with microscopic scales. Mouth parts suctorial. Metamorphosis very marked.
Examples. Butterflies, Moths.

vii. Diptera. Forewings large, membranous. Hindwings reduced to small racket shaped "balancers" Mouth parts suctorial. Metamorphosis very marked.
Example Flies, Fleas (apterous).

viii. Thysanoptera. Both pairs of wings narrow thickly fringed. Mouth parts suctorial. Metamorphosis slight.
Example. Thrips.

ix. Hemiptera. Mouth parts suctorial. Metamorphosis slight.

A. Heteroptera. Forewings basal half leathery. Hindwings membranous.
Example. Bugs.

B. Homoptera. Both wings large and membranous.
Example. Cicada (the insect that screeches round the lamps at night).

Most of the above characters refer only to the adult imagines. In the next article I propose to deal with the larval stages of some of the above divisions.

## RECRUITING

### In the Madras Presidency.

By M. J. Kennaway.

In July of last year the writer of this article contributed two letters to the "Malay Mail" under the nom-de-plume of "Horatio" pointing out amongst other things that it was up to the Immigration Department, not to do away with the professional recruiter, but with the power they have of issuing and cancelling licenses, to endeavour to devise some scheme, whereby his services in the out-of-the way districts might be utilized, without affecting the Kangany recruiter.

While I was fully aware, that it was easier to advise than devise, I was not at the time in the position to outline any definite scheme, but during my recent stay in India I have made a point of studying the question on the spot. This I did more particularly in the Northern Districts of the Presidency, though I also gave it my attention in the Southern and Eastern Districts.

As regards my investigations in the south, I came to the following conclusions, viz. that the present policy of not allowing the employment of the professional, is a perfectly correct one, with the following exception, which is that, when a planter does come over here for new connections and may be after a certain amount of trouble does find a man of some standing and position, a resident in his village and through whose influence one undoubtedly could start a new connection without interfering with others: then I say that on application to the Superintendent of Emigrants at Negapatam this man should be given a professional recruiter's license for a limited number of coolies, always provided that the rate paid as commission shall not exceed those paid by other estates in that village.

It is, I believe, a very common fallacy in the F. M. S. for planters to think that all professional recruiters will not work for under Rs. 25 to Rs. 30 a head. In many cases they are right, but without going out of my way to look for them, I discovered on my travels that there were a comparatively large number of men of standing and position who had never done any recruiting before, but who were prepared to recruit at a reasonable rate, but who were not prepared owing to reasons of caste to make the journey to the F. M. S. to secure the license. I feel therefore that in this direction we have another aid to emigration in the Southern Districts which could be made use of, but it is imperative in such cases for the manager to come over himself and get in direct touch with the man he employs. And I would add the further suggestion viz: that for all coolies that are sent over directly or indirectly through him

the manager shall enter two cents head pay, half of which is credited every month to this so called professional in India. This would give him a direct interest in the Estate as being one of its labour agents in India and so would materially assist the estate's requirements being met in future years. Now as regards my investigations in the Northern Districts of the Madras Presidency by which I refer to those 400 to 600 miles north of Madras, one must for the next few two or three years treat them on a completely different plan to the Southern Districts.

Up here I found that it is only within the last few years that emigration to the Straits has been conducted to any extent, but now they are going over in increasing numbers, the figures for this year already showing a large increase on those of last, but that practically all these connections were originally started by the professional recruiter either in Government employ, in which case he is called a Government recruiter, or otherwise. I also found that by some estates the professional is still being employed nor under the circumstances can I blame them as they are building up a nucleus that will be available to them in later years and is in the interests (provided they do not pay high rates) of the F. M. S. in general. This needless to say is being done without the knowledge of the Emigration Department.

I would here earnestly invite the Immigration Committee to consider whether they are not able to see their way to grant their men more latitude in cases where they are quite satisfied that what is proposed to be done is in the interests of F. M. S. recruiting. This I am sure would encourage a closer feeling between their Department and the planter who comes over there, as at present it is rather a waste of time than otherwise to visit the Emigration Offices at Negapatam and Madras. This is not as it should be but in my opinion, and there are others who share it, the planter on his arrival should visit the Emigration Agent and acquaint him fully with the methods of recruiting or supervising recruiting that he proposes to adopt during his stay. Then if necessary the Emigration Agent could explain how these methods might be contrary towards F.M. S. recruiting in general and could show him a more satisfactory way.

If more of this was done, I feel sure it would be in the interests of all concerned, but if the Immigration Department still continues the policy of discouraging planters from going over, as was done in the Superintendent of Immigrants' report for 1910, then perhaps it is not to be expected that they will wish to discontinue the present system which I am sure must be as distasteful to their own men on the spot as it is to planters who go over there.

Before closing this subject let me give an instance of what I mean when I say that the Emigration Agents should be allowed to use their discretion.

The writer found after a good deal of travelling practically an untapped district where coolies could be obtained in any quantity. Not having a license to recruit in that district, he went to the Emigration Office and applied for a temporary license, but was told there that they could render him no assistance and that his only way was to send over a man from the district and obtain a license in the usual way.

Now, this in addition to costing between Rs. 50 and Rs. 60 meant at least a month's delay and of course the great risk of being held up for a much longer period in quarantine. So in the meanwhile under the present system the planter who wishes to see a new connection started, has to sit down and await his recruiters' return, whereas had the Emigration Agent had the power, he could have issued a temporary license, and so saved the planter a considerable amount of his time and money and at the same time done far more to further Emigration to the Straits. I am fully aware that in time gone past they had this power and because, I presume, it appeared to be abused by professional recruiters, it was rescinded, but if they were only issued on the application of responsible people who stated both the district for which it was required and the rate of commission being paid, I feel sure that the Immigration Department would have no cause of complaint.

I have in mind however a more detailed scheme for planters, whether they are able to come over or not whereby the services of the professional might in my opinion be for the next few years employed in the newer districts with considerable advantage to Straits recruiting: this scheme I propose to outline before the end of this paper. Before doing so, I propose to state further results of my investigations of Indian labour in the more Northern parts of the Madras Presidency and Telegu districts.

If one refers to the map of the Madras Presidency, one will find marked on the coast a town called Cocanada. It is the country north of this town right up to the South of the Chilka Lake that is the country I am now referring to. Hitherto this country has been one of the many recruiting grounds for Burma, Assam, Fiji Is., Natal and the Northern districts of India, and in the rice season I learn that from the ports of Cocanada and Vizagapatnam, which is a port further North, as many as 40,000 to 50,000 go across to Rangoon and return when the season is over. These of course go over as free labourers, but that was the only system of free labour as opposed to indentured labour (with of course the exception of the F. M. S.) that I discovered there.

From what I was able to see, this district is also one of the poorest in the Madras Presidency and far more liable to droughts and famines. For instance from November to April they had scarcely had a drop of rain and the rainfall for the twelve months

ending March 31st was only 22 inches, yet this country may be said to be more or less teeming with labour.

It will therefore be seen that there are great possibilities of labour in this district.

Now what footing have we up to date secured in this Northern District which from the points I have mentioned occupies a distance of 385 miles without leaving the main line?

Thanks to the unstinted advertising by coloured pictures, which one can see in the 3rd class waiting halls in every station on the line, we have made ourselves known and talked about and moreover I learnt from reliable sources that there is a general desire throughout this district to emigrate to the Straits rather than to any of the already named countries where indentured labour exists to such an extent that professional recruiters for Assam tell the coolies that they are taking them to Penang, Singapore (as they called the Straits), and not until they arrive at some station in the North of India, where perhaps their own language is not spoken, do they realize that they have been had, with the man responsible miles away and themselves stranded without money to return.

This may not be readily believed, but I can assure my readers that from information I gathered from more sources than one, that this was by no means an uncommon occurrence and probably goes on far more than most people who are interested are aware of.

One instance that came directly under my notice is perhaps worth relating. Travelling north from Samelkot (junction for Cocanada) to Waltair, I was informed that in the same train were six Telegus being conveyed to Berhanpur under the impression that they were going to the Straits. Taking an interpreter with me, I went and interviewed them and found the case to be as stated.

I then cross-questioned the recruiter who said that his job was to take the coolies to Berhanpur and hand them over to his employer, but after that it had nothing to do with him, which way they went to Penang. I then examined his license and found that he had one printed in large letters authorizing him to collect coolies for the Federated Malay States and Assam which bore an illegible signature on behalf of a man called Ross, who I understand is a European professional recruiter for Assam Estates. I then put a constable in the carriage and wired for an assistant inspector of Emigrants and an Inspector of Police to meet the train at Waltair. I there made a formal complaint and left the matter in the hands of the police. The police were then wired to meet the train at Berhanpur and the case to be fully enquired into there. What happened eventually I do not know but I understand the matter was taken up by the authorities. I reported the matter to the Emigration Agent at Madras who told me that there were stacks of correspondence lying at Penang on this very question of Ross and

professional recruiting but apparently for some reason or other it is not at present a punishable offence and while no doubt the matter is receiving the careful attention of the Immigration Committee, it is not a matter that should be lost sight of by the P. A. M. In my opinion an additional Superintendent of Emigrants should be quartered in this district, one of whose duties would be to put a check on this traffic. It is also, I consider quite apart from looking after our own interests, our duty to assist the Government of India in every means in our power.

It therefore appears that, though there is labour in this district anxious and willing to come to the Straits, we must provide more means to enable them to do so.

The only possible means for new connections to be started in the villages in the furthest North is by the aid of the professional recruiter. The Kangany system up here is practically unknown. It is true that further South several estates started connections originally through the aid of the professional and coolies are now going over in increasing numbers, but for other estates to start connections otherwise than by the professional, is absolutely impossible, so that in the meanwhile these original estates have practically the field to themselves. This is not as it should be, when on one side of the water we have estates crying out for labour and on the other side labour crying out to come.

What now have the Emigration Department done and what are they doing to start new connections? The answer is I think a brief one. By the aid of the professional whom they employ permanently and call Government recruiters, they have in the past been very largely responsible for the estates that employ Telegu labour to-day, but these batches have been gradually growing less and less, so that I understand the intention now is to do away with them altogether, not because they are still unable to recruit, but because the commission authorized by the Penang authorities is only Rs. 12 and in consequence they are supposed to be handing over the coolies they recruit to professionals who are perhaps being paid Rs. 30 or Rs. 40 a head. In this connection, rather than do away with these regularly employed men, I would strongly advise their rate being raised to Rs. 20. (Rs. 12 is I believe the lowest rate paid by any estate North of Madras.)

The scheme I am about to propose, if adopted, would mean that before long the present Telegu connections in the F. M. S. would be doubled several times over and let me predict that in years to come, I have not the slightest doubt that there will be far more coolies recruited from North of Madras, than there will be from the South, but whether that will take place in the near future or the far, entirely depends on the policy of recruiting that is adopted now.

Let it also be remembered that the Telegu usually emigrates not by himself for the first time and his wife and family afterwards, as is usual with the Tamil, but straight away with his whole family including the grand-mother; so we have what I have previously described as the-established-family asset straight away.

As a workman I found his reputation amongst engineers and contractors who had had considerable experience of other labour on construction work, as being the best in India. I know the difficulty on estates in the F. M. S. is, to make them take care of themselves and that usually a much larger percentage of Telegus are sick than Tamils, but in these days of resident doctors and hospitals on the estate, it is only a matter, I think, of managers giving them more attention than he does to the Tamils.

Let me take the opportunity of strongly advising managers to see that on their arrival on the estates the new coolies write to their villages informing their relatives and friends of their arrival and, what is still more important, to see that every month or two they remit money to their villages even if it is only a dollar. It is one of the finest advertisements for the estate and F. M. S. in general and it is in the hands of every manager to be able to do it.

When sending letters to the villages, they should not be stamped or if stamped registered, to insure a safe delivery at out-lying villages or hamlets, as, if a postman has a ten mile walk to deliver a stamped letter, no one is the wiser if he tears it up, but when there is money or a receipt to collect, it is a different thing. This information especially about remitting money was very strongly impressed on me by an Assistant Inspector (Native) of Emigrants.

My proposed scheme, it should be clearly understood, is primarily for estates that want to start new connections but have not any Telegus to send over to start connections with, but of course at the same time it will affect other Estates, as absconding and bolting should decrease. The scheme in brief is as follows :

"The estates under certain conditions should be allowed to make use of a professional recruiter to recruit a limited number of coolies who shall be licensed by the Emigration Authorities at Madras or elsewhere."

Now it may be said that sanctioning any scheme that made use of a professional recruiter would be interfering with the Kangany recruiter, but provided that due care was taken to insure that the recruiter was going to work and did work on new ground, I feel that this would largely be avoided.

Taking it for granted that the majority of estates who now have Telegu connections, originally started them by the aid of the professional recruiter, whether Government or otherwise, it seems to me only just and fair that other estates should be allowed equal opportunities, but with the following provisions :—

(1). That estates using these licenses shall not be allowed to pay any commission exceeding Rs. 20 a head or say $12.

(2). That no estate shall be entitled to recruit more than 50 coolies which should be sufficient to form a nucleus for Kanganies to continue to recruit from. If then that estate was unable to get labour, it would probably mean, that with either management or health or other reasons there was something wrong with it.

(3). That each professional recruiter employed shall be fully registered in the Emigration Office and that on completion of the 50 coolies the license for that estate shall be cancelled and retained by the Emigration Agent.

(4). If however his original employer wishes to transfer the services of this recruiter to another Estate, he shall have the option of naming another employer, otherwise it shall be open to the Emigration Agent to transfer the services of this professional to another Estate in need of one.

(5). In the event of an employer employing a professional who does not carry out what he undertakes, it shall be in the power of the employer to request the Emigration Agent to cancel the license in question, who after due enquiry shall, if he thinks fit, do so; erase the name of that professional from the register and grant the estate a new one.

Now what will this scheme involve?

*As far as the Estates are concerned*:—Those requiring new connections will have to send over a European to find a reliable man to recruit, though of course a more economical plan would be for two or three or more estates to send over a representative and so share the expense.

*As far as the Immigration Department is concerned:* It, I suggest, would involve the following: No application for a professional's license should be granted until the visiting inspector in the Straits has satisfied himself that the Estate in question is being properly managed and has conformed to or is fulfilling the requirements of the labour health enactment. Having satisfied himself on these points, he should then endorse a short description of the Estate which should be prepared for him by the manager and which he should certify as correct. This description should state position of Estate, proximity to a railway station, kedeis etc. and, what is very important to the mind of the would-be recruited coolie, its water supply, number of wells, rivers, etc; also what wages are paid to men, women and children, stating both daily wages and cash paid for evening work; this should be shown in annas.

I suggest then that this endorsed application and so to speak prospectus of the Estate be taken and presented at the Emigration Office in Madras translated into Telegu and written on the back of the license and certified by the Emigration Agent as being a true description of the Estates for which the licensee is authorized to recruit.

It would also probably involve the Immigration authorities appointing an additional man whose head-quarters would be in the Northern Districts, as at present it is, with the camp on his hands, a sheer impossibitity for the Emigration Agent at Madras properly to supervise this district situated, as some parts of it are, 600 miles away from Madras.

The duty of this man would be mainly to supervise these professional recruiters, and to ensure as far as possible that they were recruiting on new ground; also to find out where new districts were situated until the whole of the Northern District had been thoroughly covered and every village ticked off, as having had at least one or more families recruited from it.

Such is my proposed scheme which I am fully aware can be improved on and amended in several ways but if it will in any way solve the question of shortage of Indian labour that exists to-day on so many estates, my object in proposing it will have been achieved.

Before concluding this paper, there are two matters which I would like to draw the attention of the Immigration Committee to. They are as follows:

(1). That their Emigration Agents in India should from time to time send reports of progress being made and in them state their views on matters connected with recruiting. The reason I suggest this is, because I found during my stay that views were held over there by men on the spot, which were at variance with those held by many planters this side of the water and that these men were carrying out instructions of the Immigration Committee that they did not feel were in the best interests of recruiting. Now, had there been more ventilation of their opinions, and their reasons for holding them, certain rules and regulations might never have been passed.

(2). The other matter that I refer to is, that in view of the increased emigration that is anticipated from the Northern Districts, the B. I. should be approached to see if it is not possible for them to arrange a regular service of steamers that would convey coolies direct from Vizagapatnam or Cocanada or one of the still further northern ports. This of course would entail another emigration camp being built. At present it means that the recruited coolies from the district north of Vizagapatnam are over 24 hours cooped up in a 3rd class carriage, and any one who knows what the usual 3rd class travelling is like in India, will know what I mean.

I am fully aware that it is a question that would require very serious consideration before being adopted but my own observations so far have been that in every way it would greatly further the interests of F. M. S. recruiting.

In conclusion to this paper, I would like to add that I trust nothing I have written will in any way be regarded as a hostile attitude towards the Immigration and Emigration Department. While it is true I received little or no assistance from them, what it was in their power to do, they did, and if they were unable to do more, I hold it was the system to blame and if any criticism has been levelled in this paper it has been at the policy of the Immigration Committee in too carefully guarding the interests of Kangany recruiting with the result of preventing planters who come over here exploiting districts further afield.

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## THE EFFECT OF SAWDUST ON PLANTS.

The following note appeared in Bulletin No. 158 of the Maryland Agricultural Experiment Station and was copied into the Journal of the Board of Agriculture, June, 1912. Vol. XIX p.p. 226 :—

"There is in this country a general belief among Farmers and Gardeners that farm yard or stable manure made with sawdust as litter is injurious to plants, or at least is not so valuable as that with straw. This belief is apparently also wide spread among gardeners in America and in order to ascertain if there is any real foundation for it experiments were begun in 1908 and continued on a large scale for three years with flowering plants grown in greenhouses. Comparisons were made between (1) cow manure made with sawdust (2) cow manure made with straw or chopped maize stalks as litter and (3) cow manure free from litter of any kind the cows being kept on a cement floor without bedding.

"The manure was collected and left in a heap until some fermentation had taken place. This broke down the strawy litter considerably, but the sawdust had quite a fresh appearance when it was applied. The same amount of the different manures were used and they were all thoroughly worked into the soil. The plant tested were Roses, Carnations, Chrysanthemums and Sweetpeas. In no case could any harmful effect of the sawdust be detected and, in fact, taking the average of three years the manure containing it gave slightly the largest number of blooms. For other reasons, however it was concluded that for the particular circumstances manure without litter of any kind was the best."

## EXTRACTS FROM THE MINUTES OF A MEETING OF THE IMMIGRATION COMMITTEE HELD AT KUALA LUMPUR ON AUGUST 4, 1912.

In order to reduce the amount of the outstandings it was resolved in future to impose interest on all amounts remaining unpaid for one month after they became due in accordance with the powers conferred by Section 6 of the Enactment.

Decided that attention should be called, in the original assessment notice sent to employers, to the liability to interest after 21 days; and that when the first reminders are sent out the interest due shall be calculated and added to the amount payable.

The attention of the Committee has been called to recent cases in which persons not of the labouring classes and with no intention of working as labourers have been brought over from India with free tickets at the expense of the Fund.

Free passages and recruiting allowances are granted on account of bona fide labourers and their families only; the bringing over free of other persons is a misuse of the Funds for the disbursement of which the Committee are responsible and they desire to place on record their strong disapproval of the practice and trust that employers of labour generally will co-operate with them in putting a stop to it.

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## KAJANG DISTRICT PLANTERS' ASSOCIATION.

*Minutes of General Meeting.* Held in Kajang Club at 4.20 p.m. 29th July 1912.

*Present :—*

C. Burn Murdoch (Chairman) P. F. Wise, R. C. M. Kindersley, O. P. Dakeyne, H. Gough, R. H. Moullin, F. O. K. Brown, G. F. Tyler, F. St. Barbe, A. C. Hayton, F. B. Kendall, E. G. Lyne, F. D. Sinclair.

The Minutes of last meeting were read and, after being proposed by R. C. M. Kindersley and seconded by P. F. Wise, confirmed.

*Rates :—*

The Chairman brought up the question of rates of wages in the District and after the matter had been discussed the following motion proposed by Mr. E. N. T. Cummins and seconded by the Chairman was carried ;—" That a Circular be drawn up by the Committee and circulated to all Managers asking for information as to rates paid to different classes of labourers and coolies, contract and daily, and classes of work."

*Telephone at station* :—

Mr. E. N. T. Cummins pointed out that the lack of a telephone at the Goods Office has been much felt by the distant subscribers to the telephone. At present carts are frequently sent in from near and far on receipt of advice notes for goods at the Station, but on arrival it is often found the goods have not arrived and the carts have to return empty.

A telephone at the Goods Office would obviate this loss of time and money, as subscribers to the telephone could be advised of the actual arrival of their goods. Mr. E. N. T. Cummins proposed and the Chairman seconded : " That the Government be requested to install as soon as possible a telephone at the Goods Shed at Kajang Station." Carried.

## NOTES ON THE MARKET FOR STRAITS PRODUCE DURING AUGUST, 1912.

Produce business generally has been fairly active during the month, and prices have, as a rule, kept steady with only small fluctuations either way.

*Peppers.* The Johore Black Pepper crop is coming to an end, and as usual the quality of later arrivals is extremely poor. Owing chiefly to large sales of Lampong Pepper, which crop is believed to be unusually large this season, the price has declined steadily during the month, and closes at $20.5/8 to $20.7/8 per picul in Singapore.

Sarawak White Pepper has kept very steady, business having been done at $34.7/8 to $33¾ per picul. This crop is expected to be a little smaller than last season's, and shippers have recently experienced a good deal of trouble over the quality which has steadily deteriorated during the past few years.

*Gambier.* Arrivals from Johore have been about 1,000 tons and the price has kept steady at $9.40 to $9.65.

*Copra.* During the earlier part of the month demand was exceedingly quiet, and prices kept at practically the same level until 14th, when a sharp advance took place, the month closing with an excellent market and every prospect of a further advance. Values on 31st August were :—Fine S. D. $11., Medium grades $10.60 to $10.70, Low grades $10.40 to $10.50.

*Rubber.* During the month values steadily advanced, but towards the close a slight reaction has set in, and prices have fallen away a little. Closing values are :—

| | | |
|---|---|---|
| No. 1 Pale Crepe | $260 | per picul |
| No. 2 ,, | $240 | ,, |
| Smoked Sheet | $245 | ,, |
| Unsmoked Sheet | $240 | ,, |

*Tapioca.* Is in very short supply, and prices are easy at $9 for Fair Small Flake and $8.80 for Medium Pearl. Recent arrivals have been of better quality than formerly, and there is a little more interest being taken in the article.

*Nutmegs.* Some recent speculative operations on home markets have helped this article to a higher level, but sales are trifling, and there seems to be little, if any, enquiry from anywhere. Closing values are $28 and $30 for 110s. and 80s. respectively.

*Sago Flour.* Fluctuations have been abnormally violent, and values have gone up considerably, closing at the highest. Shorts covering in U. K. and Europe is mainly responsible for the increased values. There is no lack of flour, and business in the article is very heavy. The market closes strong at from $4.45 to $4.15 per picul according to quality.

*Singapore, 3rd September, 1912.*

## List of Chief Agricultural Products exported from the Federated Malay States during the month of June, 1912.

| Articles. | Quantity. | Value, |
|---|---|---|
| *Food Stuffs.* | pls. kts | $ |
| Arecanuts | 3,933.32 | 14,034.44 |
| Coffee | 927.00 | 33,375.00 |
| Fruits (limes) | | 1,091.80 |
| Sweet potatos | 962.00 | 962.00 |
| Plantains, in bunches | 3,550.00 | 320.00 |
| Pumpkins | 94.00 | 153.00 |
| Yams, in bags | 935.00 | 3,194.00 |
| Padi | 34,397.98 | 99,259.30 |
| Pepper | 295.23 | 6,308.06 |
| Rice | 7,178.18 | 41.834 34 |
| Sugar | 2,444.30 | 8,442.58 |
| Tapioca | 2,886.47 | 4,729.12 |
| Coconuts, in units | 150.00 | 4.95 |
| *Raw Materials.* | | |
| Copra | 7,972.37 | 79,804.68 |
| Getah Grit | 1.08 | 173.00 |
| Gambier | 1,905.47 | 14,659.42 |
| Indigo | 767.00 | 2,621.00 |
| Putch leaves | 97.00 | 826.00 |
| Rattan | 2.00 | 16.00 |
| Cultivated rubber | 20,043.26 | 4,194,377.14 |
| Rubber seeds | 5.00 | 50.00 |
| Rubber plants, in no. | 111,000.00 | 222.00 |
| Rubber stumps in bundles | 277.00 | 1,298.00 |
| Cotton | 147.10 | 902.00 |

## FEDERATED MALAY STATES.

*Comparative Statement of Cultivated Rubber Exported during the Years 1912 and 1911.*

| Produced in | Exported during June, 1912. | Previously. | Total Export during the year. | Export during similar period of previous year. | Increase. |
|---|---|---|---|---|---|
| | lbs. | lbs. | lbs. | lbs. | lbs. |
| Perak ... ... ... | 769,503 | 3,725,887 | 4,495,390 | 2,207,653 | 2,287,737 |
| Selangor ... ... ... | 1,133,264 | 6,970,185 | 8,103,449 | 4,578,697 | 3,524,752 |
| Negri Sembilan ... ... | 391,440 | 2,349,132 | 2,740,572 | 1,554,589 | 1,185,983 |
| Pahang ... ... ... | 11,708 | 31,146 | 42,854 | 8,458 | 34,396 |
| Total ... | 2,305,915 | 13,076,350 | 15,382,265 | 8,349,397 | 7,032,868 |

| Exported via | To United Kingdom. | | To Continent of Europe. | | To Ceylon. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | June. | To date. | June. | To date. | June. | To date. | June. | To date. |
| | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. |
| Port Swettenham ... | 1,102,455 | 7,806,921* | 154,369 | 1,048,000 | 51,973 | 488,885* | 1,308,797 | 9,303,806 |

* 63,376 lbs. and 11,688 lbs., respectively, exported in April, 1912, but omitted to be published in that month, are now included.

KUALA LUMPUR,
*9th July, 1912.*

W. J. P. HUME,
*Commissioner of Trade and Customs, F.M.S.*

## PERAK.

*Abstract of Meteorological Readings in the various Districts of the State for the Month of July, 1912.*

| DISTRICT. | Mean Barometrical Pressure at 32° Fah. | Maximum in Sun. | TEMPERATURE. | | | | HYGROMETER. | | | | Prevailing Direction of Winds. | Total Rainfall. | Greatest Rainfall during 24 hours. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean Dry Bulb. | Maximum. | Minimum. | Range. | Mean Wet Bulb. | Vapour Tension. | Dew Point. | Humidity. | | | |
| Taiping | ... | 107 | 83.86 | 95 | 71 | 24 | 77.53 | 860 | ... | 75 | ... | 5.01 | 2.61 |
| Kuala Kangsar | ... | ... | 81.55 | 95 | 71 | 24 | 75.65 | 809 | ... | 76 | ... | 2 07 | .94 |
| Batu Gajah | ... | 115 | 83.04 | 94 | 69 | 25 | 76.27 | 815 | ... | 73 | ... | 1.04 | .36 |
| Gopeng | ... | ... | 81.69 | 92 | 68 | 24 | 74.75 | 770 | ... | 72 | ... | 2.71 | 1.18 |
| Ipoh | ... | ... | 82.32 | 93 | 69 | 24 | 76.21 | 823 | ... | 75 | ... | .84 | .34 |
| Kampar | ... | ... | 82.89 | 94 | 70 | 24 | 76.47 | 826 | ... | 75 | ... | 2.57 | 1.50 |
| Telok Anson | ... | ... | 82.15 | 93 | 70 | 23 | 77.66 | 886 | ... | 81 | ... | 1.86 | .89 |
| Tapah | ... | ... | 82.22 | 93 | 68 | 25 | 76 35 | 831 | ... | 77 | ... | 2.60 | .72 |
| Parit Buntar | ... | ... | 83.16 | 93 | 72 | 21 | 77.02 | 847 | ... | 75 | ... | 3.22 | 1.67 |
| Bagan Serai | ... | ... | 83.66 | 92 | 71 | 21 | 78 17 | 889 | ... | 77 | ... | .45 | .20 |
| Selama | ... | ... | 82.12 | 93 | 68 | 25 | 78.55 | 928 | ... | 85 | ... | 2.51 | .86 |
| Lenggong | ... | ... | 80 29 | 93 | 67 | 26 | 77.08 | 887 | ... | 87 | ... | 2.00 | .80 |
| Tanjong Malim | ... | ... | 81.24 | 92 | 68 | 24 | 76.73 | 859 | ... | 80 | ... | 3.82 | 2.04 |
| Grit | ... | ... | 80.35 | 93 | 69 | 24 | 75.55 | 821 | ... | 80 | ... | 3.28 | 1.75 |
| Klian Intan | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3.49 | .80 |
| Pulau Pangkor Laut | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2.20 | 1.20 |
| Kuala Kurau | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3.55 | 2.04 |
| The Cottage | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3.18 | .85 |
| Maxwell Hill | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2.11 | .94 |

OFFICE OF THE SENIOR MEDICAL OFFICER,
*Perak, 10th August, 1912.*

S. C. G. FOX.
*Senior Medical Officer.*

## PAHANG.

*Abstract of Meteorological Readings in the various Districts of the State for the Month of July, 1912.*

| DISTRICT. | Mean Barometrical Pressure at 32° Fah. | Maximum in Sun. | Temperature. | | | | Hygrometer. | | | | Prevailing Direction of Winds. | Total Rainfall. | Greatest Rainfall during 24 hours. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean Dry Bulb. | Maximum. | Minimum. | Range. | Mean Wet Bulb. | Vapour Tension. | Dew Point. | Humidity. | | | |
| District Hospital, Kuala Lipis. | ... | ... | 81.0 | 89 2 | 67.4 | 21.8 | 77.1 | ... | ... | ... | ... | 4.47 | 1.85 |
| do. Raub ... | ... | ... | 80.1 | 90.3 | 72.5 | 17.8 | 74.3 | ... | ... | ... | ... | 2.89 | 0.86 |
| do. Bentong ... | ... | ... | 81.3 | 90.0 | 69.5 | 20.5 | 74.9 | ... | ... | ... | ... | 2.18 | 0.53 |
| do. Pekan ... | ... | ... | 81.6 | 90.0 | 72.2 | 17.8 | 77.6 | ... | ... | ... | ... | 6.21 | 2.37 |
| do. Kuantan ... | ... | ... | 79.0 | ... | ... | ... | 73.5 | ... | ... | ... | ... | 4.10 | 2.20 |
| Dispensary. Temerloh ... | ... | ... | ... | 91.8 | 69.8 | 22.0 | ... | ... | ... | ... | ... | 5.96 | 2.00 |
| Kuala Tembeling ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2.44 | 1.22 |
| Sungei Lembing ... | ... | ... | ... | 91.0 | 72.2 | 18.8 | ... | ... | ... | ... | ... | 7.88 | 3.45 |

OFFICE OF THE SENIOR MEDICAL OFFICER,
Selangor, Negri-Sembilan and Pahang,
*Kuala Lumpur, 24th August, 1192.*

(Sd.) G. D. FREER,
Senior Medical Officer,
*Selangor, Negri-Sembilan and Pahang.*

## SELANGOR.

*Abstract of Meteorological Readings in the various District of the State for the Month of July, 1912.*

| DISTRICT. | Mean Barometrical Pressure at 32° Frh. | Maximum in Sun. | TEMPERATURE. | | | | HYGROMETER. | | | | Prevailing Direction of Winds. | Total Rainfall. | Greatest Rainfall during 24 hours. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean Dry Bulb. | Maximum. | Minimum. | Range. | Mean Wet Bulb. | Vapour Tension. | Dew Point. | Humidity. | | | |
| General Hospital Kuala Lumpur. | 29.907 | 148.8 | 81.2 | 90.7 | 73.5 | 17.2 | 76.5 | 0.822 | 73.3 | 76 | Calm. | 4.64 | 1.86 |
| Prisons. ,, ,, | ... | ... | ... | ... | ... | ... | ... | .. | ... | ... | ... | 2.95 | 1.03 |
| District Hospital, ,, | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2.59 | 0 89 |
| ,, Klang | ... | ... | ... | 89.8 | 71.9 | 17.9 | ... | ... | ... | ... | ... | 2 81 | 1.30 |
| ,, Kuala Langat | ... | ... | ... | 89.2 | 69.7 | 19.5 | ... | ... | ... | ... | ... | 2.31 | 1.05 |
| ,, Kajang | ... | ... | ... | 87.2 | 75.5 | 11.7 | ... | ... | ... | ... | ... | 2.45 | 1.21 |
| ,, Kuala Selangor | ... | ... | ... | 88.5 | 70.0 | 18.5 | ... | ... | ... | ... | ... | 2.46 | 0.85 |
| ,, Kuala Kubu | ... | ... | ... | 92.3 | 69.8 | 22.5 | ... | ... | ... | ... | ... | 9.17 | 3.30 |
| ,, Serendah | ... | ... | ... | 92.3 | 70.5 | 21.8 | ... | ... | ... | ... | ... | 2.31 | 0 92 |
| ,, Rawang | ... | ... | ... | 92.0 | 71.5 | 20.5 | ... | ... | ... | ... | ... | 2.25 | 0.73 |
| Sabah Bernam | | | | | | | | | | | | 9.95 | 0 50 |

OFICE OF THE SENIOR MEDICAL OFFICER.
Selangor, Negri-Sembilan and Pahang.
*Kaala Lumpur, 17th August, 1912.*

(Sd.) G. D. FREER.
Senior Medical Officer,
*Selangor, Negri-Sembilan and Pahagang.*

## NEGRI-SEMBILAN.

*Abstract of Meteorological Readings in the various Districts of the State for the Month of July, 1912.*

| DISTRICT. | Mean Barometrical Pressure at 32° Fah. | Maximum in Sun. | TEMPERATURE. | | | | HYGROMETER. | | | | Prevailing Direction of Winds. | Total Rainfall. | Greatest Rainfall during 24 hours. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Mean Dry Bulb. | Maximum. | Minimum. | Range. | Mean Wet Bulb. | Vapour Tension. | Dew Point. | Humidity. | | | |
| District Hospital, | | | | | | | | | | | | | |
| „ Seremban | ... | 149.3 | 80.1 | 88.0 | 72.0 | 16.0 | 76.0 | 0.825 | 73.3 | 80 | N. W. | 5.25 | 1.60 |
| „ Kuala Pilah | ... | ... | 80.3 | 89.5 | 71.4 | 18.1 | 76.4 | 0.840 | 73.9 | 81 | ... | 4.76 | 1.68 |
| „ Mantin | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 4.24 | 1.50 |
| „ Tampin | ... | 149.9 | 79 6 | 87.7 | 72.5 | 15.2 | 75.5 | 0.813 | 72.6 | 80 | ... | 8.69 | 1.60 |
| „ Jelebu | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3.79 | 1.00 |
| „ Port Dickson | ... | 154.4 | 81.2 | 87.2 | 73.9 | 13.3 | 77.2 | 0.856 | 74.4 | 80 | ... | 6.74 | 1.68 |
| Beri-beri Hospital „ | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 6.88 | 1.42 |

OFFICE OF THE SENIOR MEDICAL OFFICER,
Selangor, Negri-Sembilan and Pahang.
*Kuala Lumpur, 20th August, 1912.*

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## STRENGTH OR COLOUR STANDARDS.

The present moment is of particular interest to producers who have sold forward plantation rubber, not so much on account of the fact that they have lost on the bargain, but that they are being compelled to buy in against rejected consignments. It would appear that by "first quality latex" is meant, not rubber of first quality from point of strength and general physical characteristics, but material which is of a certain colour. The reason for this confusion lies in the process of doing business, and not because the actual manufacturers desire all or even the greater part of their rubber in the pale form. We have been in communication with numerous manufacturers and brokers on the subject, and in deference to their wishes, do not propose to deal with their views at the present moment. But we must, at this juncture, impress upon all dealers that the sooner the colour basis is broadened the better for all business in futures. If rubber is to be rejected, not because it is not good and of real first-class quality, but because it is not pale enough, we feel sure from our own knowledge of the methods now being adopted that trouble will ensue.

The object of the present contribution is forcibly to remind producers that they should, for the future, aim at marketing rubber which is uniform, and of the best strength. Colour alone is no criterion of actual value, in fact it might well be that a good proportion of the rubber now passing as "first quality latex" is vastly inferior to darker kinds which are rejected by the dealers responsible for forward contracts. While this unsound basis is adhered to, planters will take care that rubber, irrespective of its real quality, is sent in the pale form, now that the use of sodium bisulphite is known to be effective in that respect. But we hasten to inform all producers that certain manufacturers have already told us that if they detect the mineral referred to in any estate's produce they will not buy any more from the same plantation. No doubt planters will